

HYDE  
DECK MACHINERY

HYDE WINDLASS COMPANY  
BATH, MAINE. U.S.A.

VM  
861  
H94  
1915  
c.1  
ROBARTS





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# **HYDE**

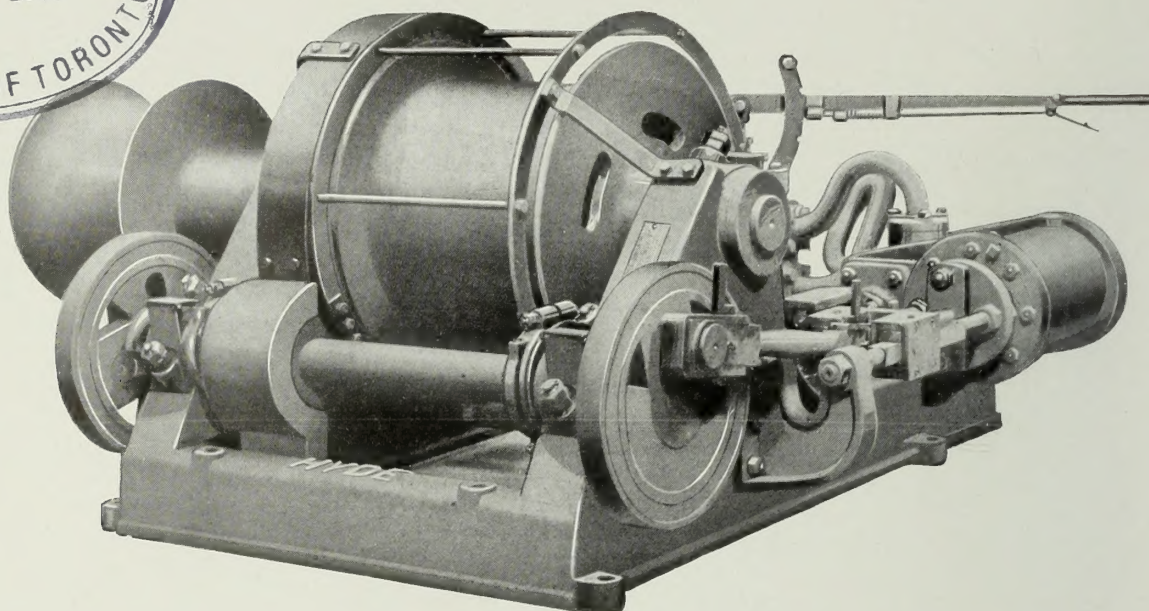
## **STEAM CARGO WINCH**



**HYDE WINDLASS COMPANY**

**Bath, Maine**

**No. 17**



## **THE HYDE STEAM CARGO WINCH**

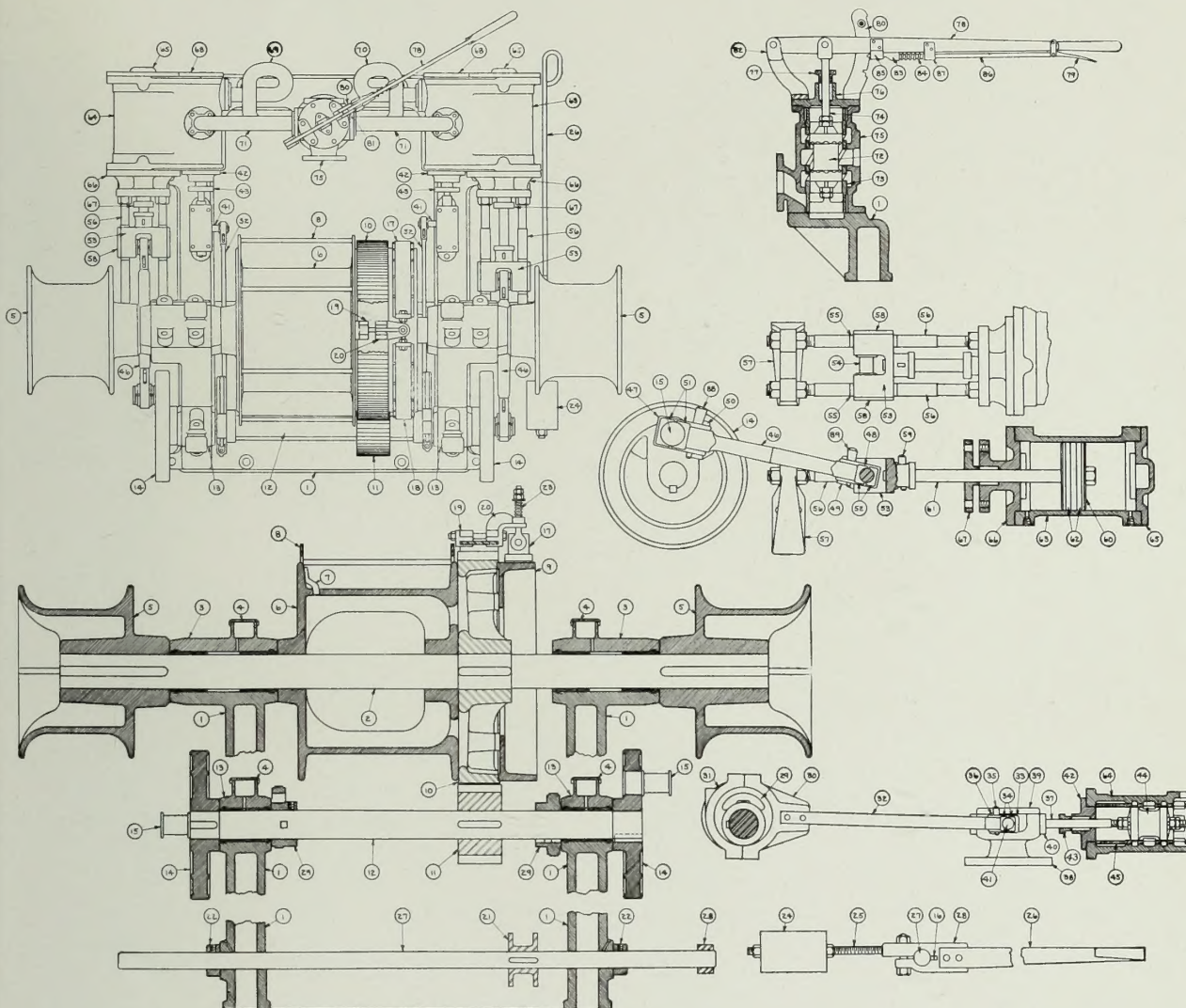
A high grade winch designed for rapid handling of cargo made in sizes  $8\frac{1}{4} \times 8$  and  $8\frac{1}{4} \times 10$ .

Winches of this type have been installed on the S. S. "Malolo," "Malika," "Bienville," "Dixie," "El Oceana," "Finland," "Kroonland," "Katrina," "Luckenbach," "Walter Luckenbach," "Marnie," "Aisne," "Anaconda," "Eastern Dawn," "Eastern Glade," "Imoko," "Volunteer," "Independence," "J. L. Luckenbach," "Julia Luckenbach," "Edward Luckenbach," "F. J. Luckenbach."

All bearings throughout winch have adjustable bronze boxes. The gearing is steel with machine cut teeth. Piston rods and valve stems are made of monel metal. Copper piping between cylinders, and metallic packing is fitted in the stuffing boxes.



# LIST OF PARTS FOR STEAM CARGO WINCH

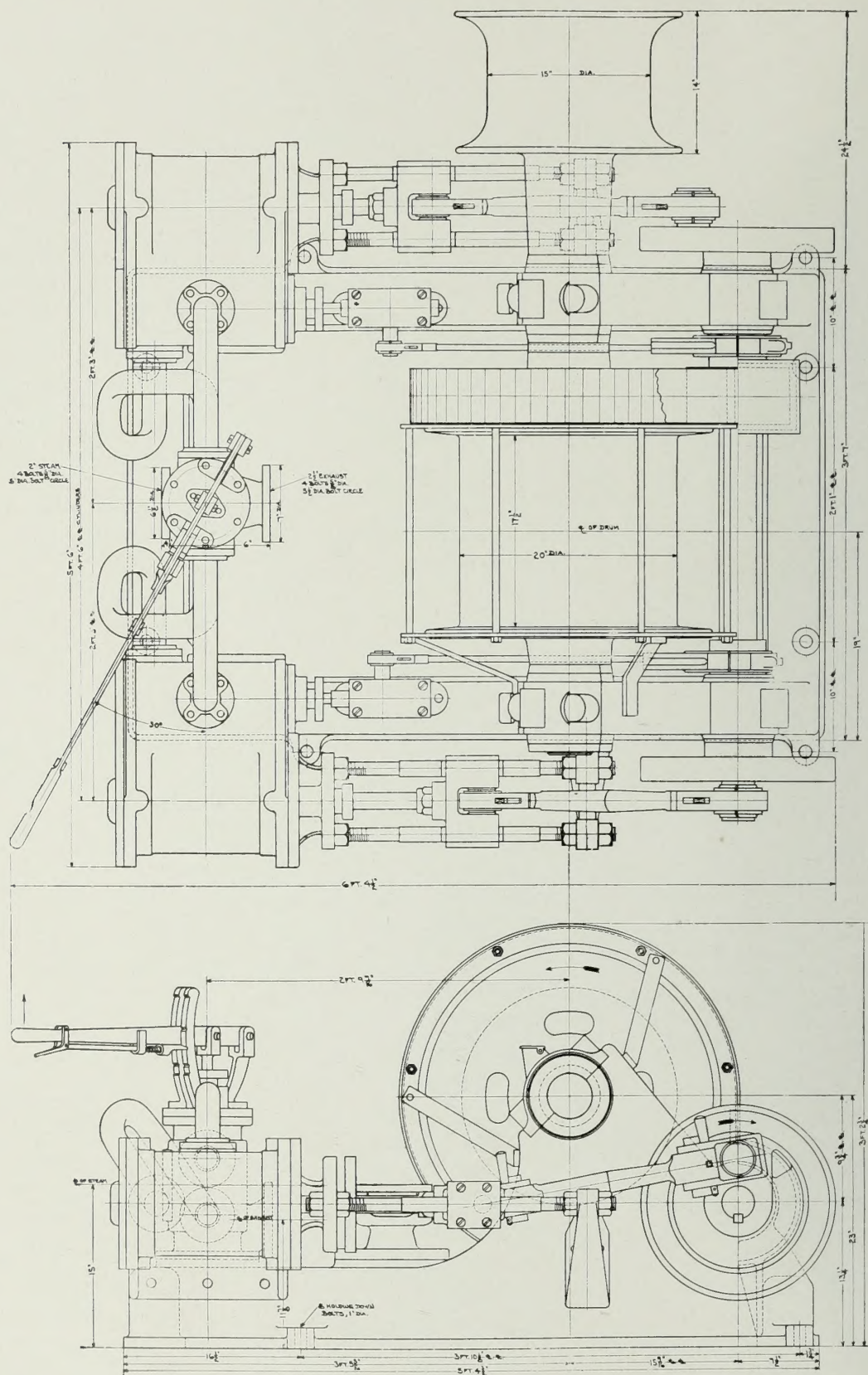


LIST OF PARTS

No. of Parts	Name of Parts	No. of Parts	Name of Parts	No. of Parts	Name of Parts
1	Bedplate and Side Bearings.	30	Eccentric Strap (Half).	60	Piston.
2	Drum Shaft.	31	" " Rod.	61	" " Rod.
3	" " Bearing Cap.	32	" " Strap.	62	" " Ring.
4	Oil Box Cover.	33	" " Box (Half).	63	Cylinder.
5	Head.	34	" " Key.	64	" " Head.
6	Drum.	35	" " Gib.	65	" " and Stuffing Box.
7	Wire Rope Clip.	36	Valve Stem.	66	Gland.
8	Rope Guide Complete	37	" " Guide.	67	Steam Chest Cover.
9	Friction Rim.	38	" " Cap.	68	Copper Pipe.
10	Spur Gear.	39	" " Block.	69	" "
11	" " Pinion.	40	" " Pin.	70	Reverse Valve.
12	Crank Shaft.	41	" " Stuffing Box.	71	" " Liner.
13	" " Bearing Cap.	42	" " Gland.	72	" " Stem.
14	" " Disk.	43	Piston Valve.	73	" " Body.
15	" " Pin.	44	" " Liner.	74	" " Head and Stuffing Box.
16	Special Key.	45	Connecting Rod.	75	" " Stuffing Box Gland.
17	Friction Band (Half).	46	" " Strap.	76	" " Lever.
18	" " Support	47	" " Gib.	77	" " Grip.
19	" " Cam.	48	Crank Pin Box (Half).	78	" " Quadrant (Half).
20	" " Collar.	49	Crosshead Pin Box (Half).	79	" " Bracket.
21	" " Hanger Eye Bolt.	50	Crosshead.	80	Latch.
22	" " Counterweight.	51	" " Pin.	81	" " Spring.
23	" " Rod.	52	" " Gib.	82	" " Guide.
24	Foot Lever.	53	" " Slide.	83	" " Rod.
25	" " Shaft.	54	" " Bracket.	84	" " Guide.
26	" " and Counterweight.	55	" " Cap.	85	Connecting Rod Key.
27	Holder.	56	" " Key.	86	
28	Eccentric Sheave.	57		87	
29		58		88	
		59		89	



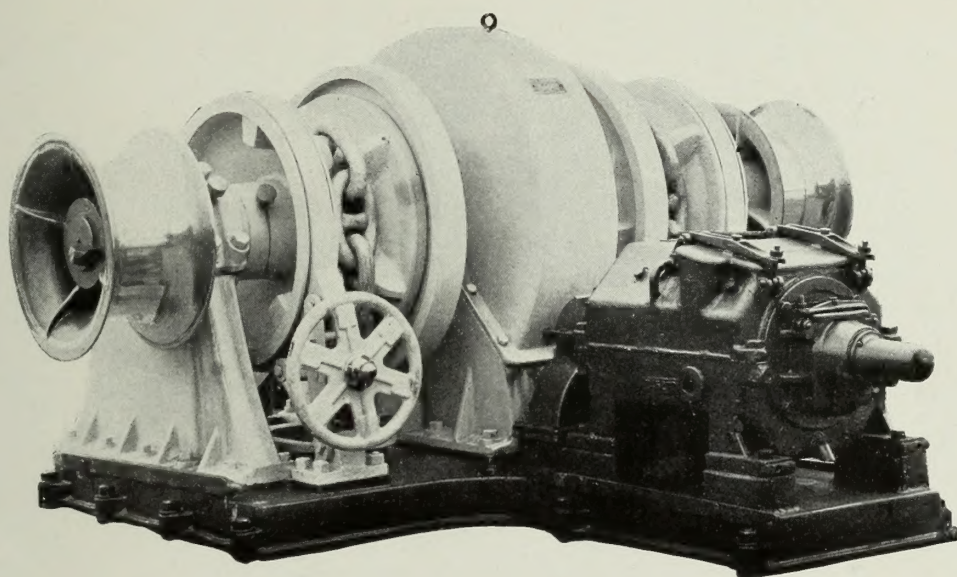
## PLAN OF HYDE STEAM CARGO WINCH





# **HYDE**

**WINDLASSES AND STEERING GEARS**  
*for*  
**YACHTS AND MOTOR BOATS**



**ELECTRIC WINDLASS**  
*As Installed On*  
**YACHT CORSAIR**

**HYDE WINDLASS COMPANY**  
**BATH, MAINE**

**No. 19**

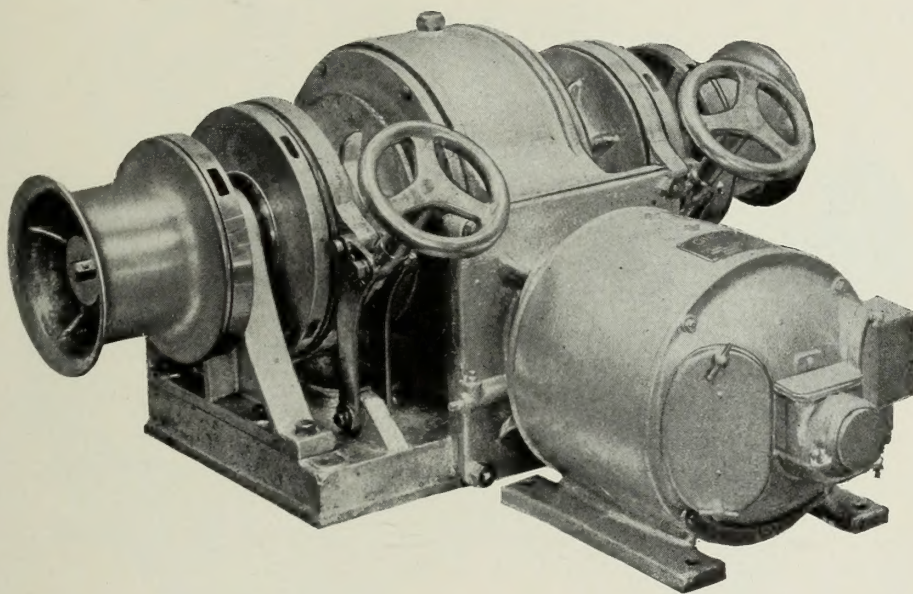
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**A**N IMPORTANT CONSIDERATION in the design of windlasses, capstans, winches and steering gears for installation on yachts or motor boats is that all parts of the machine be readily accessible. This is especially important in assembly of the electric motor with mechanical parts. An examination of the illustrations in this catalog shows all motors in the open where they can be quickly opened up for examination or adjustment. The gearing on all machines is enclosed in oil tight housing. All gear teeth are accurately hobbled and worm threads milled. Ball or roller bearings to take thrust of worm. In most instances yacht auxiliaries for locating on deck have mechanical parts galvanized with bronze trimmings. We are in position to furnish any type or size of auxiliaries to meet specifications.

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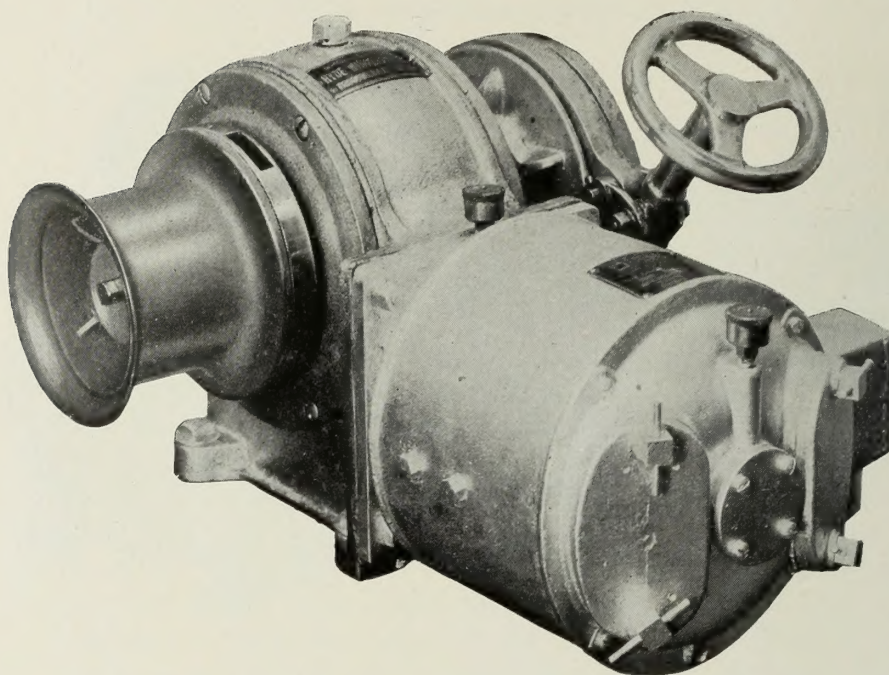
# Hyde Electric Ratchet Windlass



## Two Wildcats and Two Gysys

Size	Diam. Chain	Motor H.P.	Diam. Gypsy	Length F-A	Width	Height	Distance Between Chains	Weight	Capacity	
									Pounds	Feet
C	$\frac{1}{4}'' - \frac{3}{8}''$	1	5"	$21\frac{3}{4}''$	$30\frac{3}{4}''$	$13\frac{1}{2}''$	$9\frac{1}{2}''$	400	660	25
B	$\frac{7}{16}'' - \frac{1}{2}''$	$1\frac{1}{2}$ - 2	6"	32"	$35\frac{1}{4}''$	$16\frac{3}{4}''$	$11\frac{1}{2}''$	635	1000	25
A-A	$\frac{9}{16}'' - \frac{5}{8}''$	3-4	7"	$35\frac{1}{4}''$	42"	$20\frac{3}{8}''$	13"	850	2000	25

# Hyde Electric Ratchet Windlass

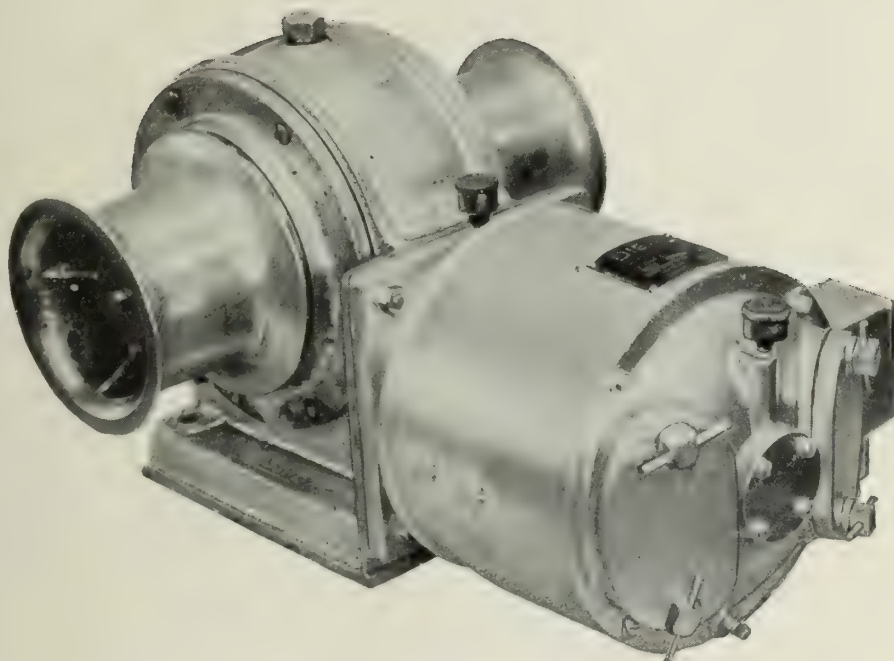


## One Wildcat and One Gypsy

Size	Diam. Chain	Motor H.P.	Diam. Gypsy	Length F-A	Width	Height	Weight	Capacity		Distance Chain from Centre
								Pounds	Feet	
C	$\frac{1}{4}" - \frac{3}{8}"$	1	5"	$21\frac{3}{4}"$	$17\frac{3}{4}"$	$13\frac{1}{2}"$	285	660	25	$4\frac{3}{4}"$
B	$\frac{7}{16}" - \frac{1}{2}"$	$1\frac{1}{2}$ -2	6"	32"	$20\frac{3}{4}"$	$16\frac{3}{4}"$	400	1000	25	$5\frac{3}{4}"$
A-A	$\frac{9}{16}" - \frac{5}{8}"$	3-4	7"	$35\frac{1}{4}"$	$24\frac{1}{4}"$	$20\frac{3}{8}"$	670	2000	25	$6\frac{1}{2}"$



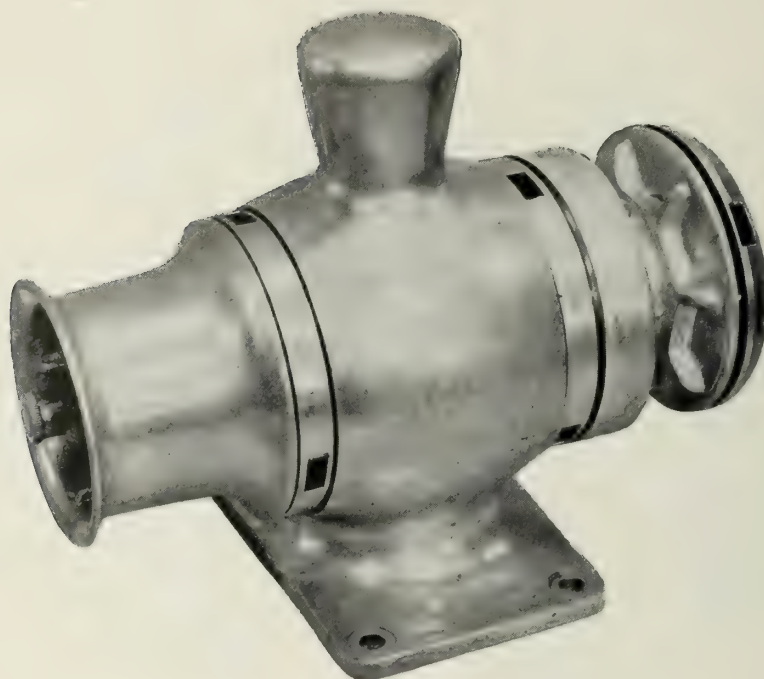
## Hyde Electric Boat Winch



This winch is used for general purposes such as warping, hoisting boats or hoisting anchor with cables. We make them in all sizes and capacities.

Size	Diam. Gypsy	Motor H.P.	Length F-A	Width	Height	Weight	Capacity		
							Pounds	Feet	
C	5"	1	21 $\frac{3}{4}$ "	15 $\frac{7}{8}$ "	13 $\frac{1}{2}$ "	233	350	50	
B	6"	2	32 $\frac{1}{4}$ "	18 $\frac{1}{8}$ "	17"	385	800	50	
A-A	7"	3							

## Hyde Ratchet Windlass

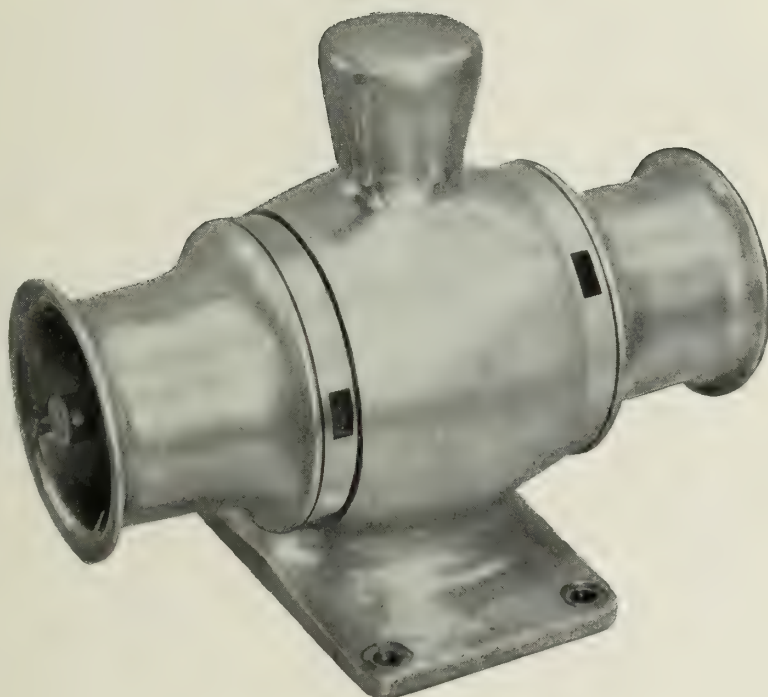


### One Wildeat and One Gypsy

Size	Diam. Chain	Diam. Gypsy	Length F-A	Width	Height	Weight	Lift	Distance Chain From Centre	
C	$\frac{1}{4}"$ $\frac{3}{8}"$	$4\frac{3}{4}"$	10	$17\frac{3}{8}"$	13"	100	400	6"	
B	$\frac{7}{16}"$ $\frac{1}{2}"$	$5\frac{3}{4}"$	12	$20\frac{3}{8}"$	15"	185	600	$7\frac{1}{4}"$	
A A	$\frac{9}{16}"$ $\frac{5}{8}"$								



## Hyde Ratchet Gypsy

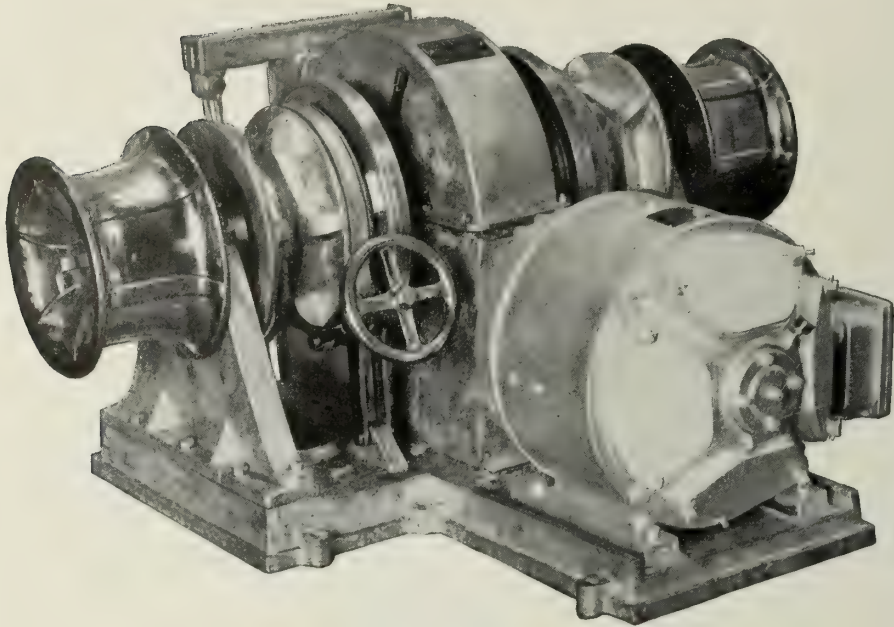


### Two Gypsys

Size	Diam. Gypsy	Length F-A	Width	Height	Weight	Pull		
C	4 $\frac{3}{4}$ "	10	16 $\frac{1}{4}$ "	13"	90	400		
B	5 $\frac{3}{4}$ "	12	18 $\frac{1}{2}$ "	15"	170	600		
A-A								

# Hyde Electric Windlass

## with Pump Brakes

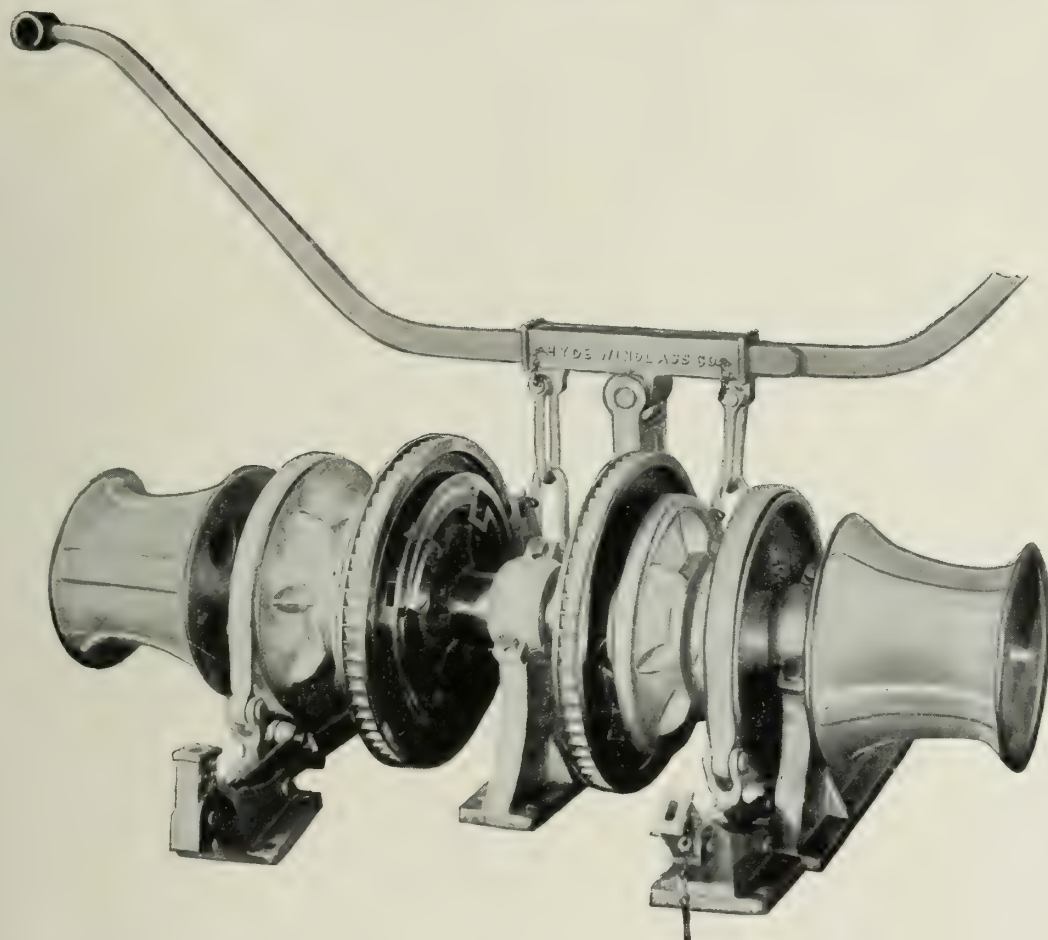


### Two Wildcats and Two Gypsies

Size	Diam. Chain	Motor H.P.	Diam. Gypsy	Length F and A	Width	Height	Weight	Distance Between Chains
A	$\frac{3}{4}$ "	5½	7"	3'-8¼"	4'-3"	22½"	1720	20½"
O	$\frac{7}{8}$ "	7½	10"	4'-5"	4'-5¼"	2'-4⅛"	2800	25"
1	1"	10	10"	5'-8"	5'-3"	2'-10½"	4000	2'-7"
2	1⅛"	12	12"	6'-2"	6'-6½"	3'-3"	6300	2'-10¼"
3	1¼"	15	13½"	6'-6"	6'-11"	3'-5½"	6800	2'-10"
4	1⅜"	20	13½"	6'-8½"	6'-11"	3'-5½"	7300	2'-10"
5	1½"	25	16"	7'-2"	8'-1"	3'-11"	11000	3'-5½"
6	1⅝"	30	16"	7'-10"	8'-2"	4'-4½"	13000	3'-6½"
7	1¾"	35	16"	8'-1"	8'-8"	4'-6"	15000	3'-8"



## Hyde Pump Brake Windlass



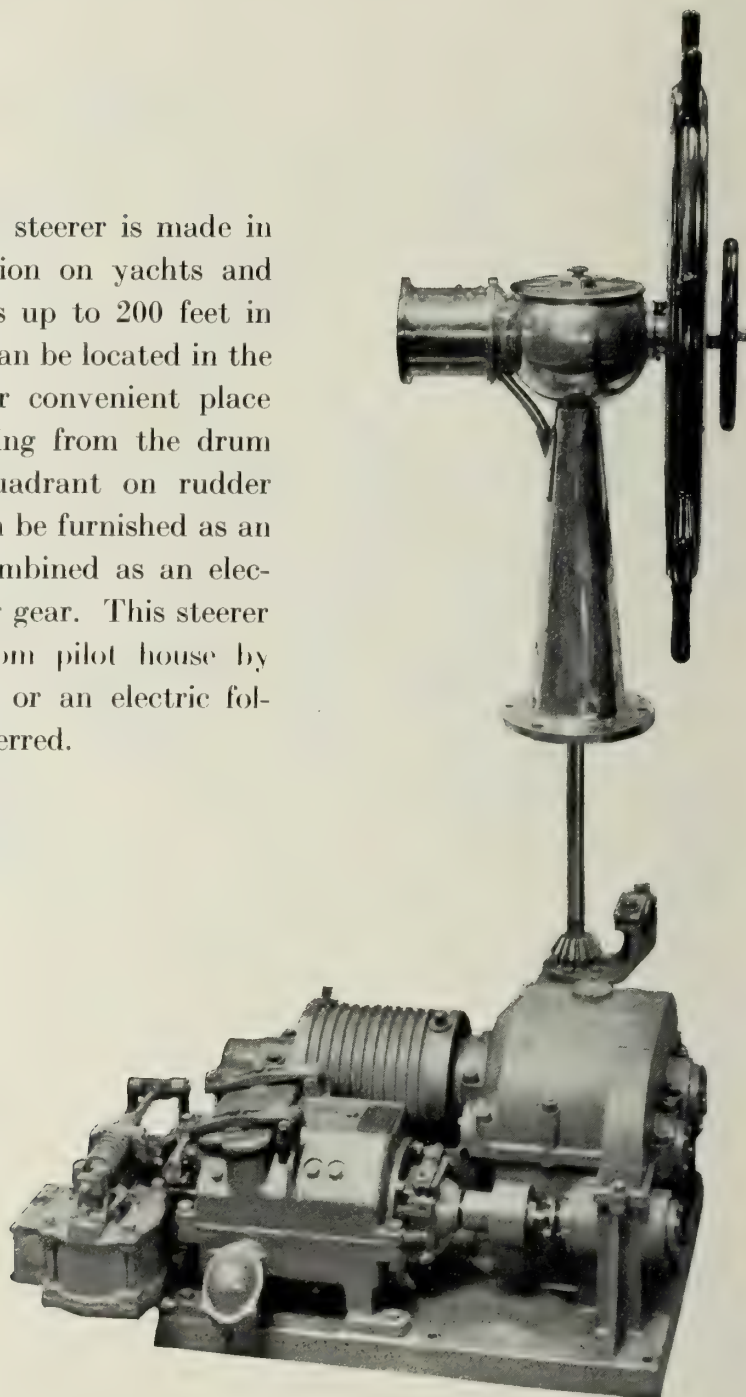
### Two Wilcats and Two Gypsys

Size	Diam. Chain	Diam. Gypsy	Length F and A	Width	Height	Weight	Distance Between Chains
C	$\frac{1}{4}$ " - $\frac{3}{8}$ "	$4\frac{3}{4}$ "	2'-0"	3'-0"	16	330	$13\frac{1}{2}$ "
B	$\frac{7}{16}$ " - $\frac{1}{2}$ "	5"	2' - $31\frac{1}{2}$ "	3'- $4\frac{3}{4}$ "	18	460	$15\frac{7}{8}$ "
A-A	$\frac{9}{16}$ " - $\frac{5}{8}$ "	7"	2'-5"	3'-9"	20	650	$17\frac{3}{8}$ "
A	$1\frac{1}{16}$ " - $\frac{3}{4}$ "	7"	2'-8"	3'- $10\frac{1}{4}$ "	21	850	$18\frac{3}{4}$ "
O	$1\frac{3}{16}$ " - $\frac{7}{8}$ "	10"	3'-0"	4'-0"	26	1100	$20\frac{3}{4}$ "

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## Hyde Electric Drum Steerer

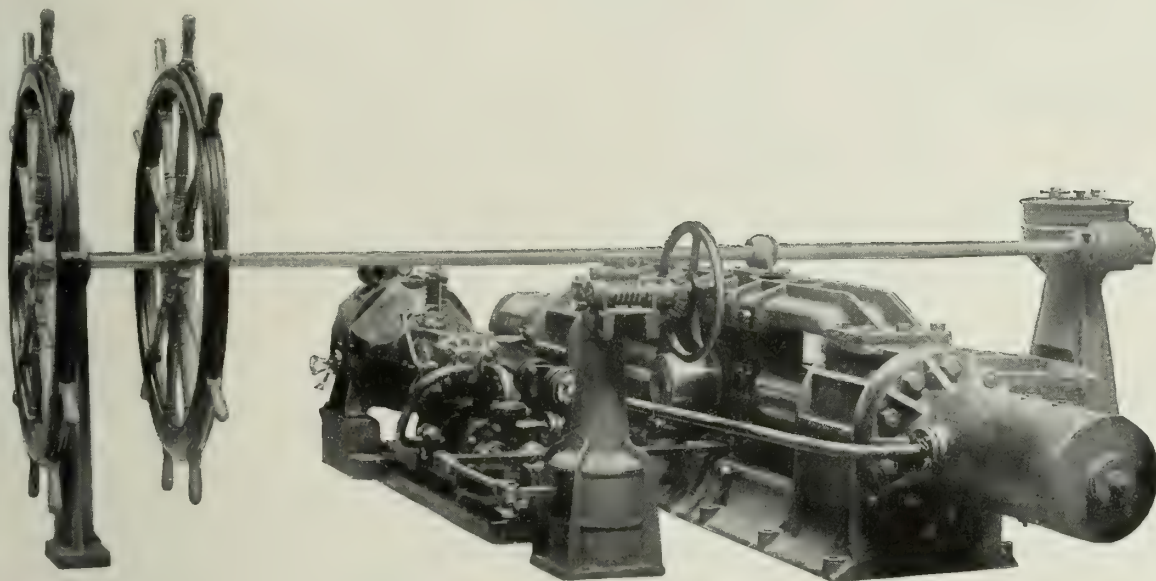
The electric drum steerer is made in all sizes for installation on yachts and other types of vessels up to 200 feet in length. This steerer can be located in the engine room or other convenient place with wire ropes leading from the drum aft connecting to quadrant on rudder post. This steerer can be furnished as an electric steerer, or combined as an electric and hand steering gear. This steerer can be controlled from pilot house by electric non-follow-up or an electric follow-up control as preferred.





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## Hydro-Electric Steering Gear



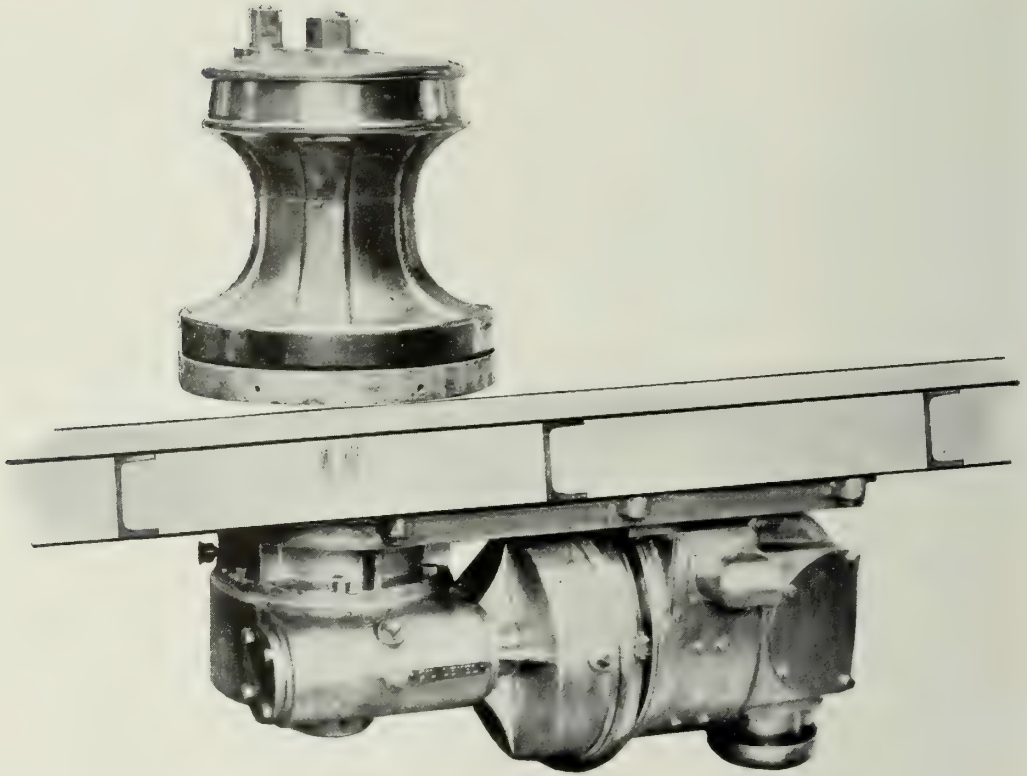
The hydro-electric steering gear was designed for installation primarily on diesel or electrically equipped vessels. This is a very efficient type of steering gear, quiet in operation and requiring very little attention as oil is used in the system. The power consists of an electric motor operating a variable stroke pump at constant speed. The oil from the pump is delivered to the ram cylinders under pressure up to 800 lbs., although even higher pressures are used where it is desired to save weight in the steering gear. Automatic follow-up mechanism is provided, controlled from bridge or pilot house. Hand steering connections can be furnished same as shown in cut. The larger vessels, however, have dual pumping units and omit hand wheels and gearing. This type of steering gear has been furnished for such yachts as the "HI-ESMARO," "VANDA," "CORSAIR," "SAVARONA," also the principal merchant vessels built in the past twelve years including the "CALIFORNIA," "VIRGINIA," "PENNSYLVANIA," "GULFPRIDE," "GULFCREST," "J. W. VANDYKE," "SANTA CLARA," "SANTA ROSA," "SANTA PAULA," "SANTA LUCIA," "SANTA ELENA," "ST. JOHN," "ARCADIA," "G. HARRISON SMITH," "W. S. FARISH" and "BORINQUEN."

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# Hyde Electric Capstan

*with*

## Hand Crank Operation

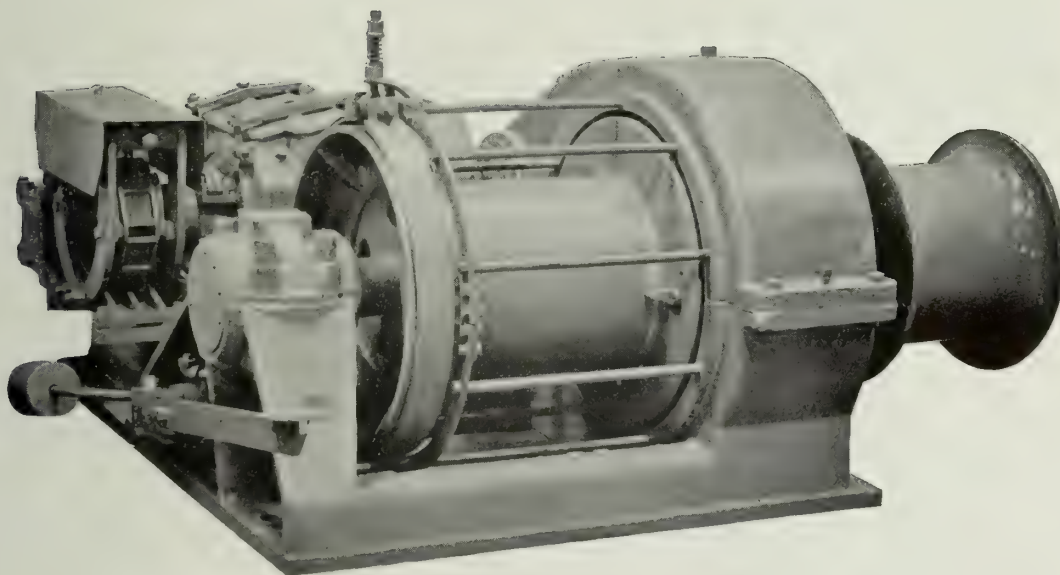


The electric capstan illustrated above designed for handling rope, chain or cable is generally used on large motor boats or yachts where space forward is not sufficient for a horizontal windlass. This type of electric capstan can also be installed aft for warping purposes. The capstan has internal gears and when operated by hand crank makes a powerful equipment. The capstan can be furnished in any size with motor and gearing below deck as shown in cut, or made a self-contained unit for locating above deck. A gypsy can be supplied in place of a capstan if preferred. We gladly send plans and quote prices upon receipt of requirements.



# **HYDE**

## **ELECTRIC CARGO WINCH**



**HYDE WINDLASS COMPANY**

**Bath, Maine**

**No. 20**

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# **I n t r o d u c t o r y**

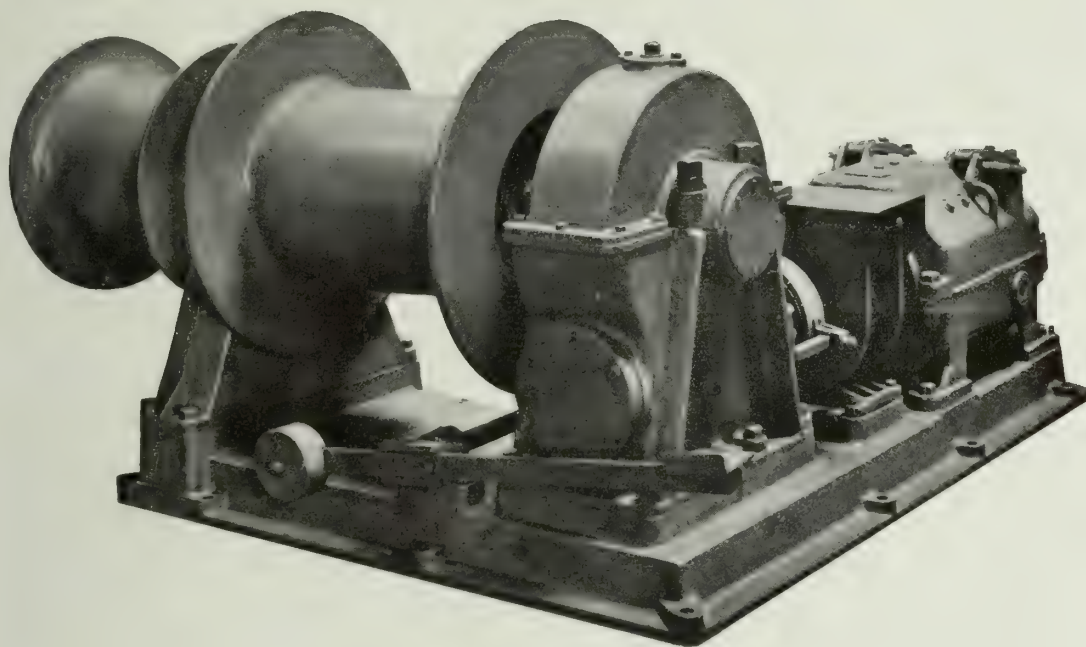
## **HYDE ELECTRIC CARGO WINCH**

**T**HERE are two types of electric cargo winches illustrated in this Bulletin; the spur geared type on page 7 and worm geared type on page 3. Both of these winches have a very high efficiency. They are generally furnished with a single drum and one gypsy. The winches are made rights and lefts for assembling in pairs at each hatch. The gearing is enclosed in oil-tight housing, thus assuring constant lubrication. The worm geared winch has the gear made of hard gear bronze with teeth accurately hobbled. The worm shaft is forged of alloy steel, threads of worm are milled, heat treated and finished to a high degree of accuracy. Ball bearings are fitted on the worm shaft to take both radial and thrust loads. In the case of the spur geared winches there are two sets of gear reduction. The pinions are made of forged steel and the gears of cast steel. The teeth of the gearing are accurately cut. Winches are equipped with marine water-tight motors self-contained on bedplate with winch. Each motor is equipped with a solenoid brake, also foot brakes are fitted in addition if required. Upon receipt of specifications we will be glad to furnish plans and prices for either the worm or spur geared type winch of any capacity for cargo handling.



# **ELECTRIC CARGO WINCH**

## *Worm Geared Type*

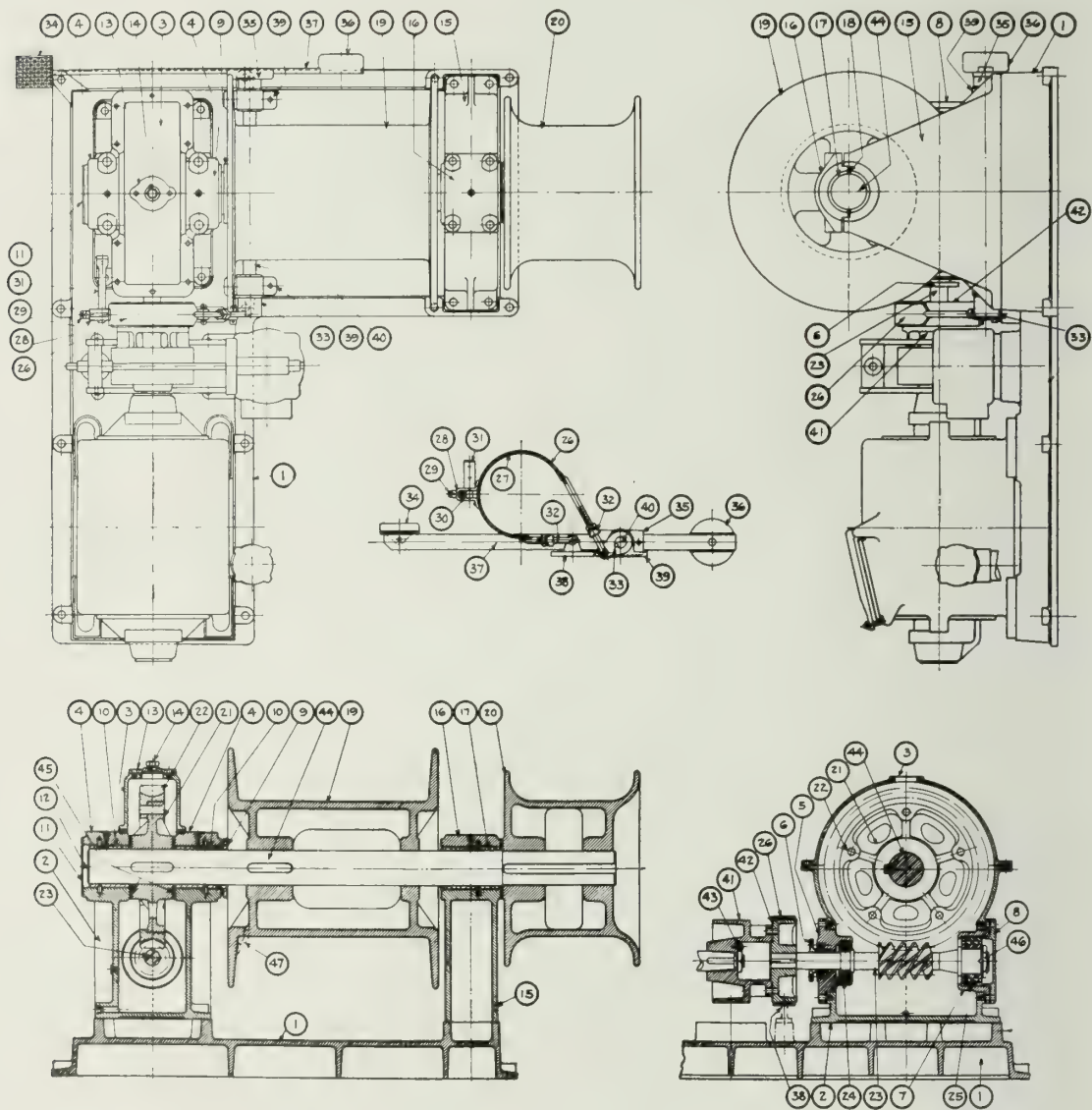


A high speed cargo winch, very quiet in operation. Winches of this type are installed on the Panama Mail Line, S.S. "SANTA ROSA," "SANTA LUCIA," "SANTA PAULA" and "SANTA ELENA." This worm geared winch is made in three sizes, two, three and five-ton. The overall dimensions and weight are given on page 6, list of parts on pages 4 and 5. A powerful and efficient cargo winch. The light line speed is around 800 feet per minute.

Size	H.P.	Capacity-Pounds	Speed Rope	Weight
2-Ton	25	1000 to 4000	330' to 200'	5670
3-Ton	35	2000 to 6000	350' to 240'	6385
5-Ton	50	2000 to 10000	325' to 180'	8735

# ELECTRIC CARGO WINCH

*Worm Geared Type*





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# **ELECTRIC CARGO WINCH**

## *Worm Geared Type*

### No. LIST OF PARTS

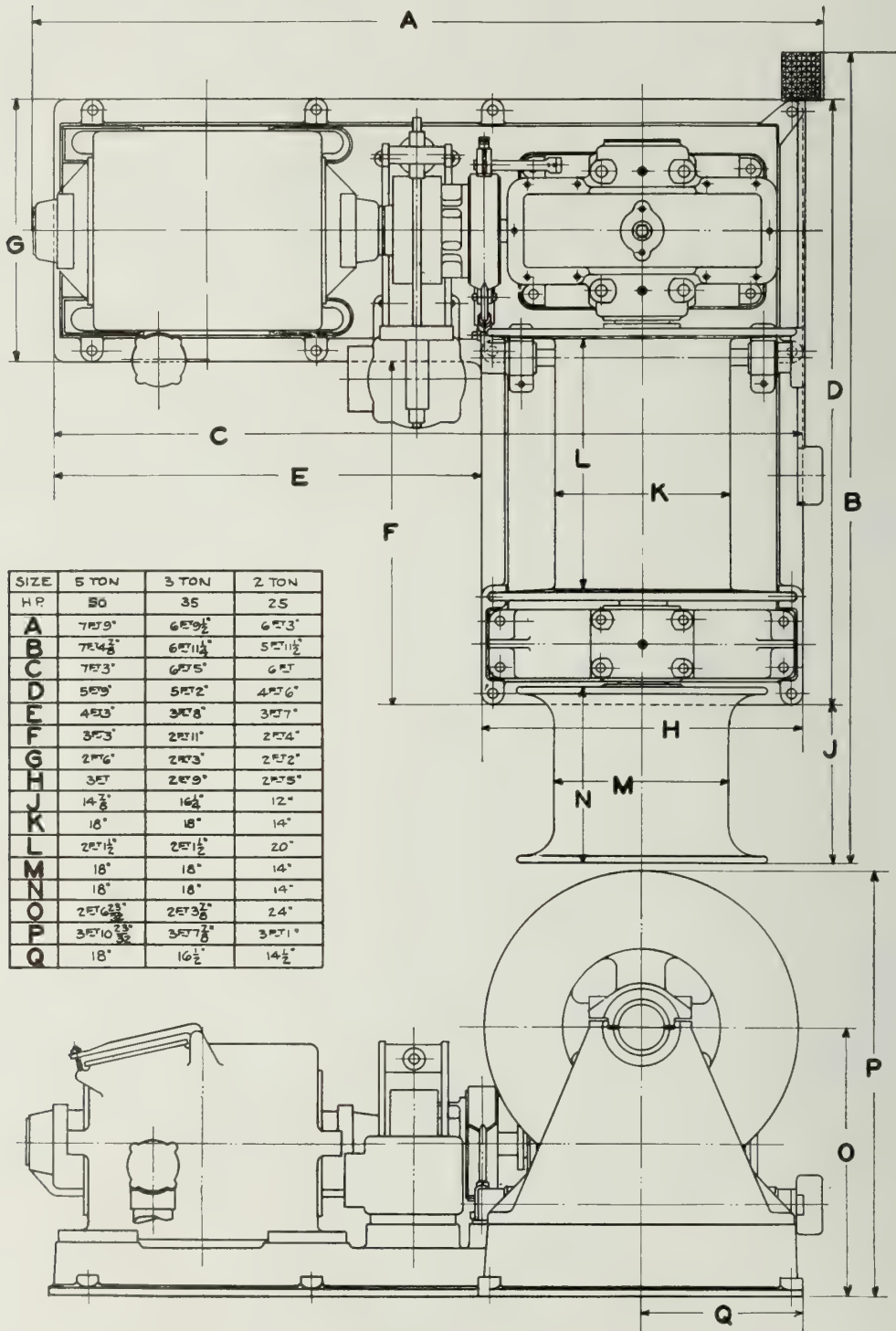
- 1 Bed Plate.
- 2 Gear Casing.
- 3 Gear Casing Cover.
- 4 Main Bearing Cap.
- 5 Radial Ball Bearing Cage.
- 6 Stuffing Box Gland.
- 7 Thrust Ball Bearing Cage.
- 8 Thrust Ball Bearing Retainer.
- 9 Drum Shaft Gland.
- 10 Bearing Box.
- 11 Cover Plate.
- 12 Main Bearing Liners.
- 13 Oil Hole Cover.
- 14 Vent Plug.
- 15 Drum Shaft Bearing.
- 16 Drum Shaft Bearing Cap.
- 17 Drum Shaft Bearing Box.
- 18 Drum Shaft Bearing Liner.
- 19 Drum.
- 20 Head.
- 21 Worm Gear Center.
- 22 Worm Gear Rim.
- 23 Worm Shaft.
- 24 Radial Ball Bearing.

### No. LIST OF PARTS

- 25 Thrust Ball Bearing.
- 26 Friction Band.
- 27 Friction Band Lining.
- 28 Friction Band Adjusting Yoke.
- 29 Friction Band Adjusting Screw.
- 30 Friction Band Adjusting Spring.
- 31 Friction Band Support.
- 32 Friction Band Turnbuckle.
- 33 Friction Lever.
- 34 Friction Foot Lever Pedal.
- 35 Friction Lever Hub.
- 36 Friction Lever Counter-weight.
- 37 Friction Foot Lever.
- 38 Friction Eye.
- 39 Friction Shaft Bearing.
- 40 Friction Shaft.
- 41 Break Drum for Motor Shaft.
- 42 Friction Drum for Worm Shaft.
- 43 Locking Clip for Motor Shaft Nut.
- 44 Drum Shaft.
- 45 Drum Shaft Thrust Collar.
- 46 Worm Shaft Nut and Washer.
- 47 Clip for Wire Rope.

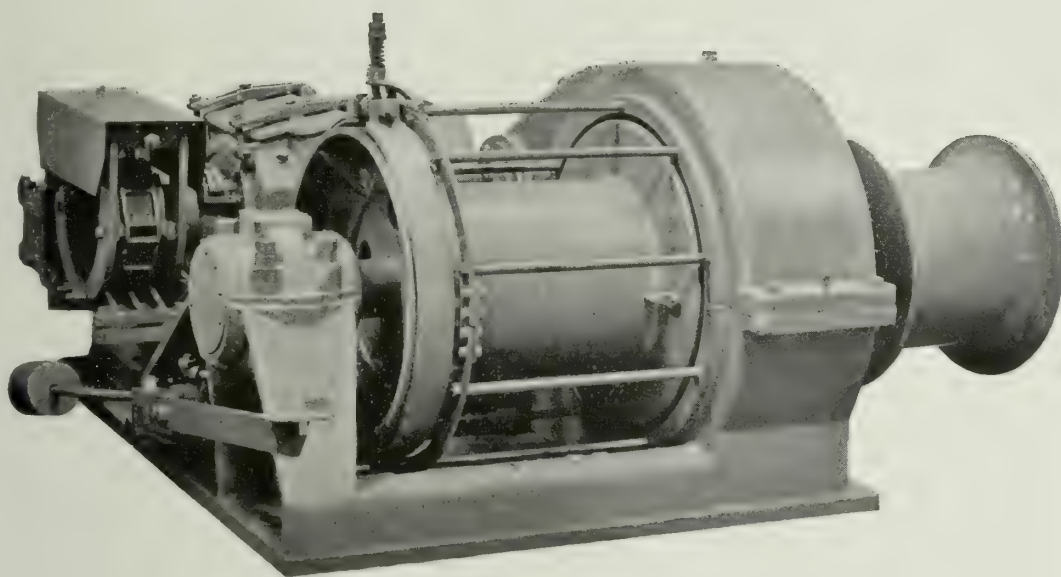
# ELECTRIC CARGO WINCH

*Worm Geared Type*



# ELECTRIC CARGO WINCH

## *Spur Geared Type*



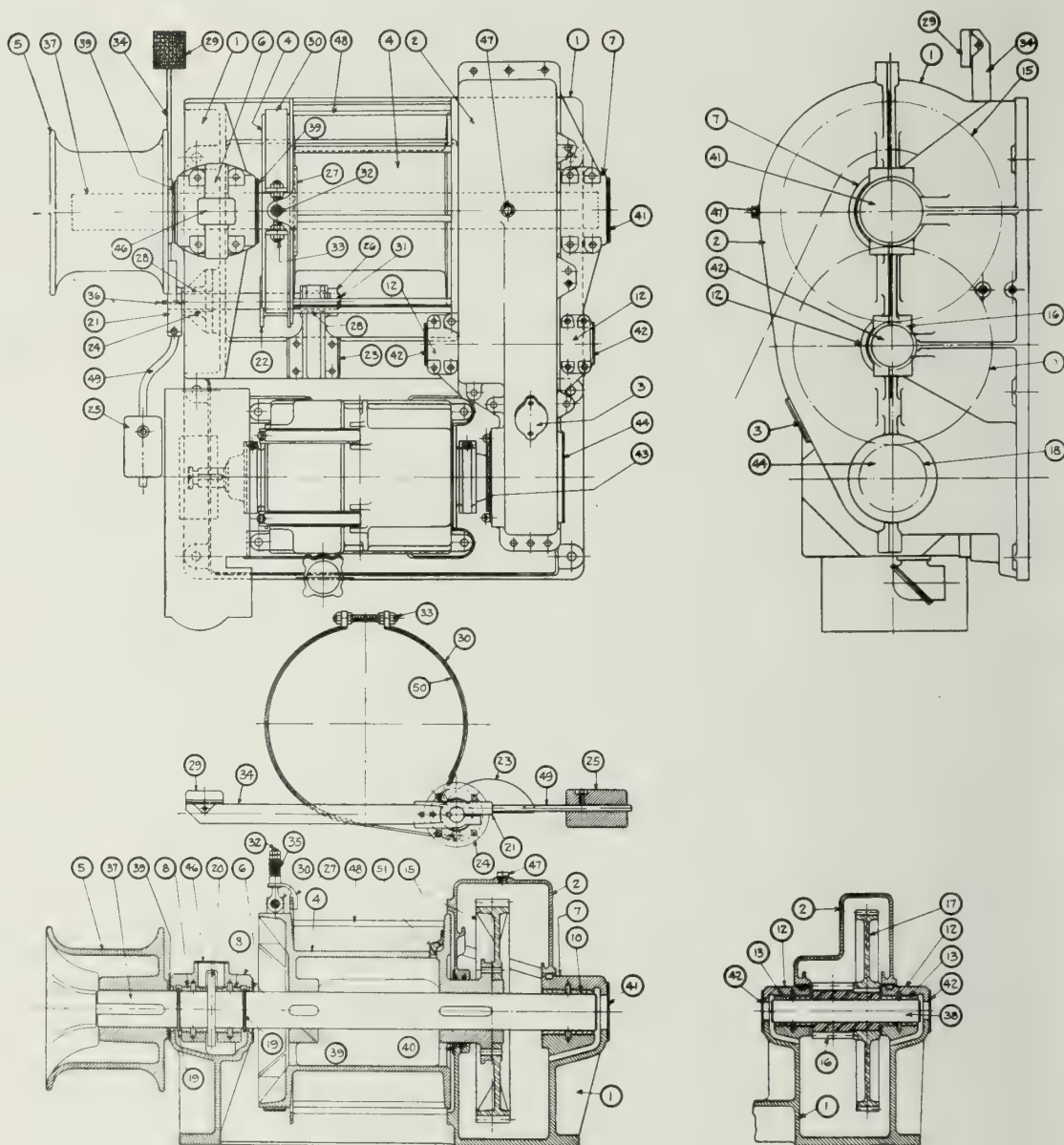
Winches of this type are installed on the new United Mail Line Steamships "ANTIQUA," "QUIRIGUA," "VERAGUA" and also the following: M.S. "COURAGEOUS," "DEFIANCE," "TRIUMPH," "CITY OF ELWOOD," "WARD," "POTTER," "NEW ORLEANS," "WICHITA" and "JEFF DAVIS." The winches are single drum, two gear reduction. The teeth of gearing are machine cut. Bearings are self-lubricated and the gearing is enclosed in oil-tight casing. The winches are made in three sizes, two, three and five-ton. The dimensions are given on page 10 and list of parts on pages 8 and 9.

Size	H.P.	Capacity-Pounds	Speed Rope	Weight
2-Ton	25	1000 to 4000	330' to 200'	5860
3-Ton	35	2000 to 6000	350' to 240'	6750
5-Ton	50	2000 to 10000	325' to 180'	9030



# ELECTRIC CARGO WINCH

*Spur Geared Type*



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# ELECTRIC CARGO WINCH

## *Spur Geared Type*

### No. LIST OF PARTS

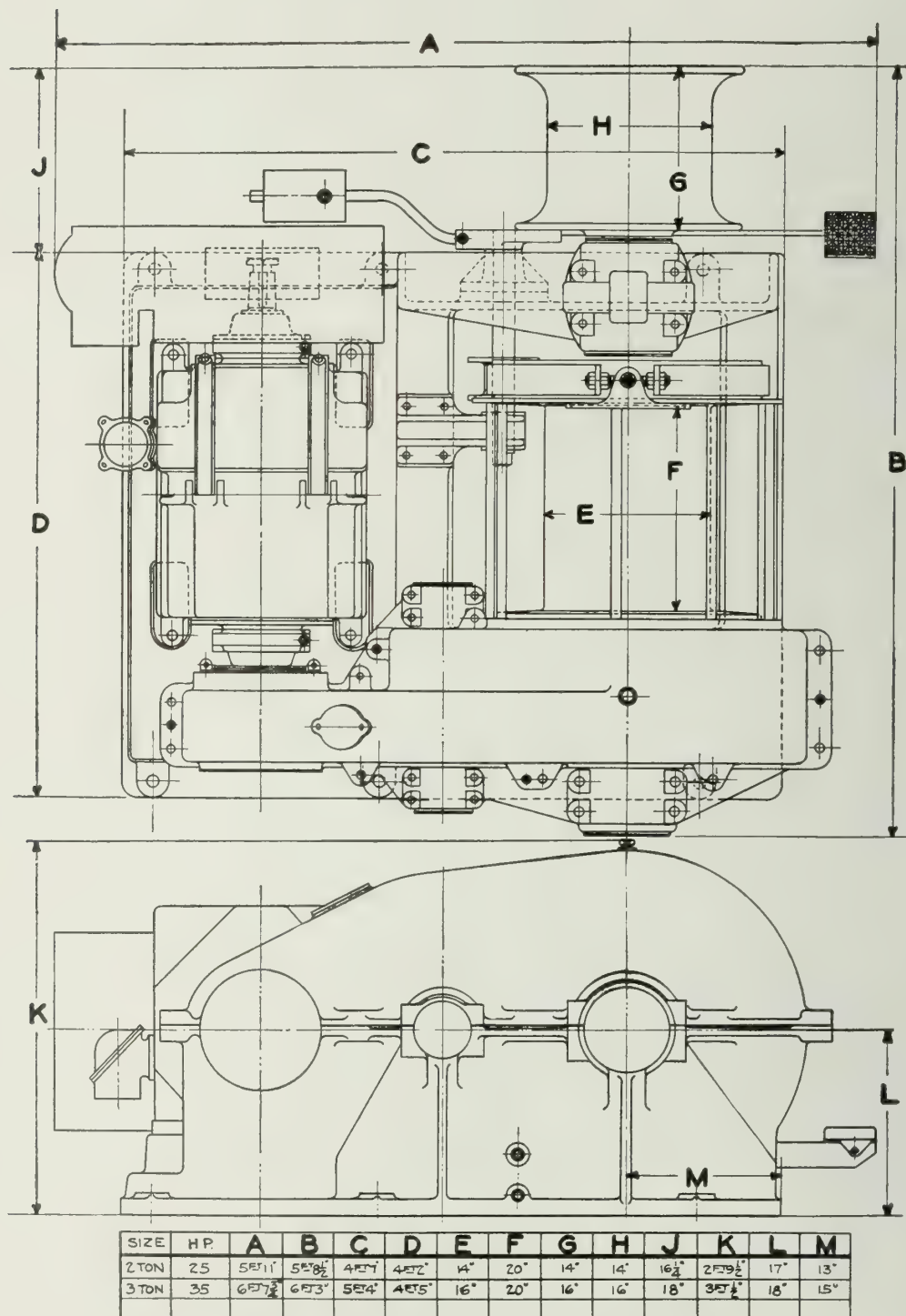
- 1 Bed, Frame and Gear Case.
- 2 Gear Casing Cover.
- 3 Hand Hole Cover.
- 4 Drum.
- 5 Head.
- 6 Drum Shaft Bearing Cap (Long).
- 7 Drum Shaft Bearing Cap (Short).
- 8 Drum Shaft Long Bearing Box (Inside) or (Outside).
- 9 Drum Shaft Long Bearing Box Liner
- 10 Drum Shaft Short Bearing Box.
- 11 Drum Shaft Short Bearing Box Liner.
- 12 Intermediate Shaft Bearing Cap
- 13 Intermediate Shaft Bearing Box
- 14 Intermediate Shaft Bearing Box Liner.
- 15 Main Spur Gear.
- 16 Main Spur Pinion.
- 17 Intermediate Spur Gear.
- 18 Motor Pinion.
- 19 Oil Flinger.
- 20 Split Oil Collar.
- 21 Foot Lever and Counter-weight Holder.
- 22 Friction Cam.
- 23 Friction Shaft Bearing (Inboard).
- 24 Friction Shaft Bearing (Outboard).
- 25 Counter-weight.

### No. LIST OF PARTS

- 26 Friction Shaft Collar.
  - 27 Friction Support.
  - 28 Friction Bearing Bushing (Inboard) or (Outboard).
  - 29 Friction Foot Lever Pedal.
  - 30 Friction Band (2 Pieces).
  - 31 Friction Shaft.
  - 32 Friction Hanger Eye Bolt.
  - 33 Friction Stud.
  - 34 Friction Foot Lever.
  - 35 Friction Spring.
  - 36 Friction Shaft Special Key.
  - 37 Drum Shaft.
  - 38 Intermediate Shaft.
  - 39 Drum Shaft Felt Retainer (2 Pieces).
  - 40 Drum Shaft Felt Retainer (2 Pieces).
  - 41 Drum Shaft Cover Plate.
  - 42 Intermediate Shaft Cover Plate.
  - 43 Motor Shaft Oil Retainer.
  - 44 Motor Shaft Cover Plate.
  - 45 Oil Wiper.
  - 46 Oil Wiper Cover Plate.
  - 47 Vent Plug.
  - 48 Rope Guard.
  - 49 Counter-weight Rod.
  - 50 Friction Brake Lining.
  - 51 Clip for Wire Rope.
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# ELECTRIC CARGO WINCH

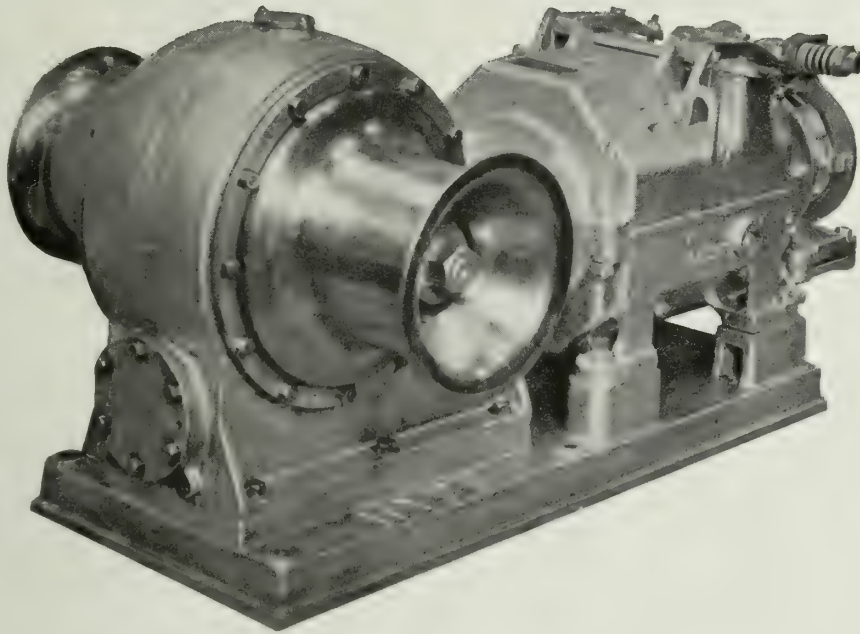
*Spur Geared Type*





# ELECTRIC BOAT WINCH

*Worm Geared Type*

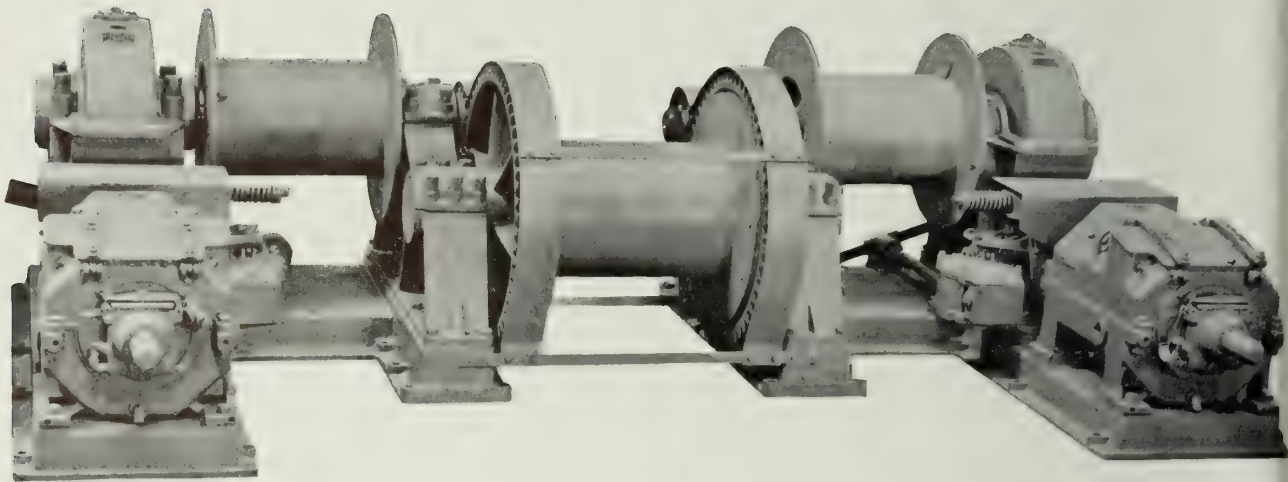


H.P.	Diam. Gypsy	Capacity		Length	Breadth	Height	Weight
		Pull	Feet				
5	6 $\frac{3}{4}$ "	1000	50	3' -10"	19 $\frac{1}{2}$ "	20"	810
7 $\frac{1}{2}$	6 $\frac{3}{4}$ "	1500	100	4' -2"	19 $\frac{1}{2}$ "	20"	1085
10	10"	2000	100	4' -9"	36"	28"	1710
15	10"	2500	100	5' -1"	36"	29"	2200
20	12"	3800	100	5' -5"	36"	32"	2910
25	15"	5000	100	6' -3"	3' -6"	34"	3625

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# **ELECTRIC CARGO WINCH**

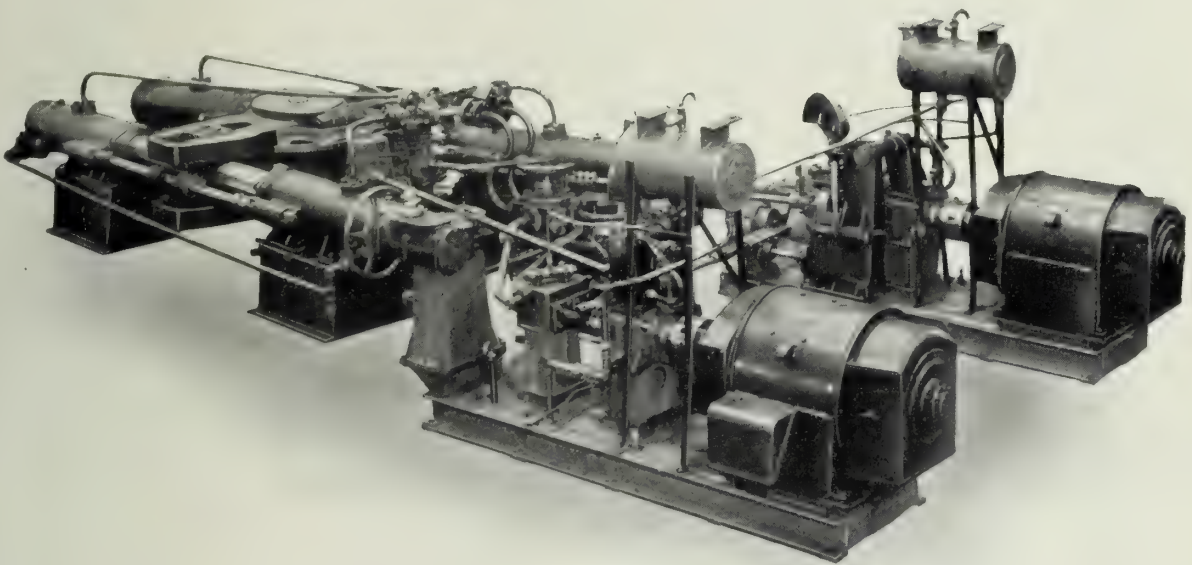
*Worm Geared Type*



Two fifty horsepower worm geared cargo winches geared to a large center drum for handling fifty-ton loads. Winches of this type are installed on the new Panama Mail S.S. "SANTA ROSA," "SANTA LUCIA," "SANTA PAULA" and "SANTA ELENA."

# **HYDE**

## **HYDRO ELECTRIC STEERING GEAR**



**HYDE WINDLASS COMPANY**  
**BATH, MAINE**

No. 22



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## HYDRO ELECTRIC STEERING GEAR

### DESCRIPTION AND OPERATION

**T**HE steering gear, illustrated on page 1 and shown on pages 3, 4 and 5 is an electric hydraulic type with full storage motion. It consists essentially of a power unit and plunger unit: all in the steering gear compartment.

The power unit has a dual pumping system, each consisting of a constant speed motor driving a Waterbury variable stroke pump. The two pumps are connected to a six-way plug cock which is in turn connected through tubing to the plunger unit through a relief valve. This cock operated by a lever allows either the starboard or port power unit to be used.

The plunger unit consists of two plungers and four cylinders mounted in fore and aft directions. The tiller on rudder stock is located between the rams and is fitted with sliding blocks.

### OPERATING

Steering is accomplished by any one of three means: Sperry — telemotor — or trickwheel.

1. Before starting either power unit, check steerer to see that vent plug cock is in the closed position (V) and that power transfer valve indicates the selected power unit. Also see that the cylinder cut out valves (A) (B) (C) (D) are open and drain or by-pass valves (E) (F) (G) (H) and pump drain valves (S) (W) are closed.

2. To use either port or starboard power unit, put transfer valve lever to side selected and start corresponding motor.

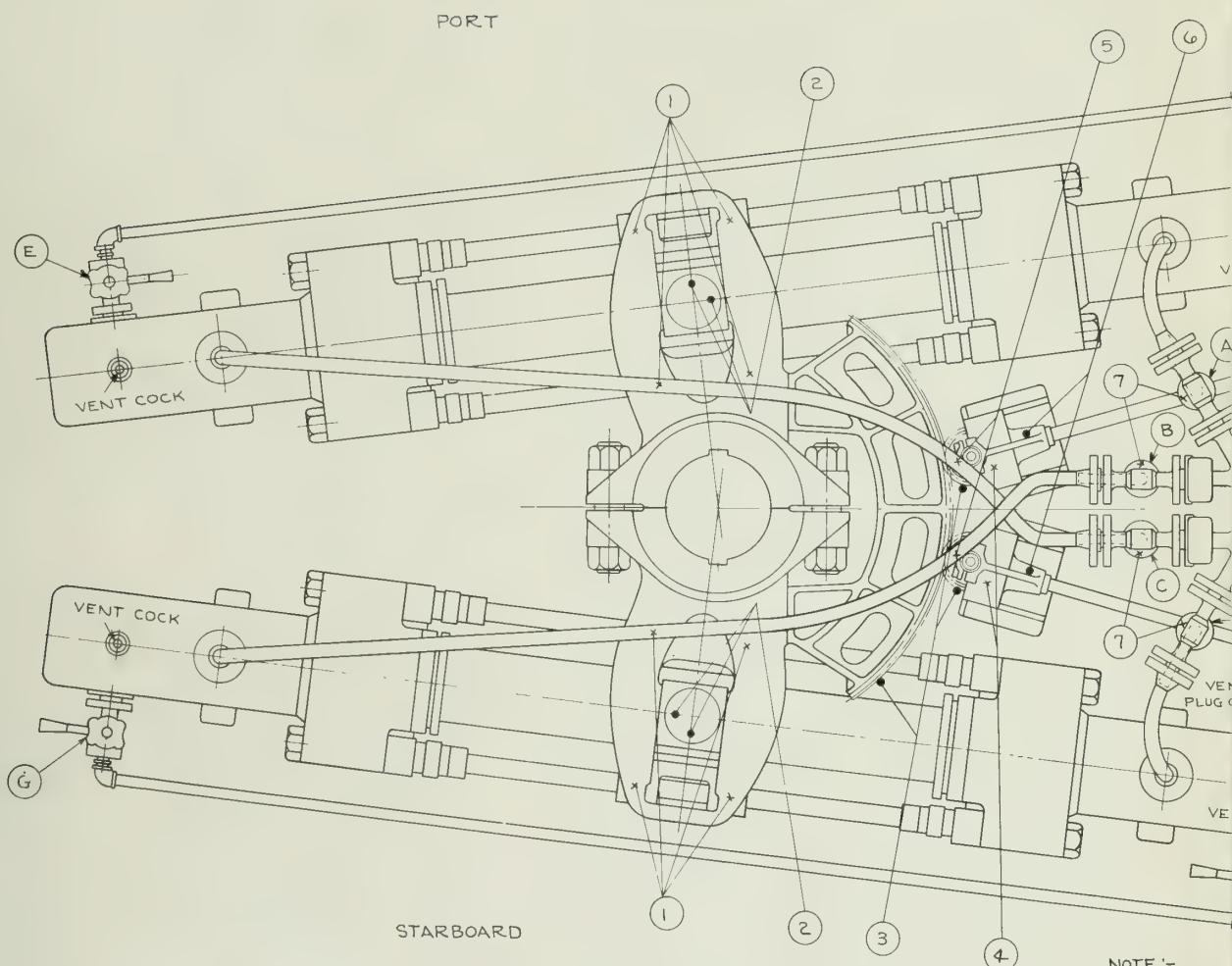
3. To change from one power unit to the other, start other motor and when steering gear is in a followed-up position, throw transfer lever to other side.

4. For steering by trickwheel or from after steering station, remove locking pin (Y) from its normal location in telemotor lever and insert in hole (X). Clutch (T) at vertical shaft to be engaged only when steering from after steering station.

5. Remove pin (Y) from hole (X) and replace in normal location when returning to "Sperry" gyro control.

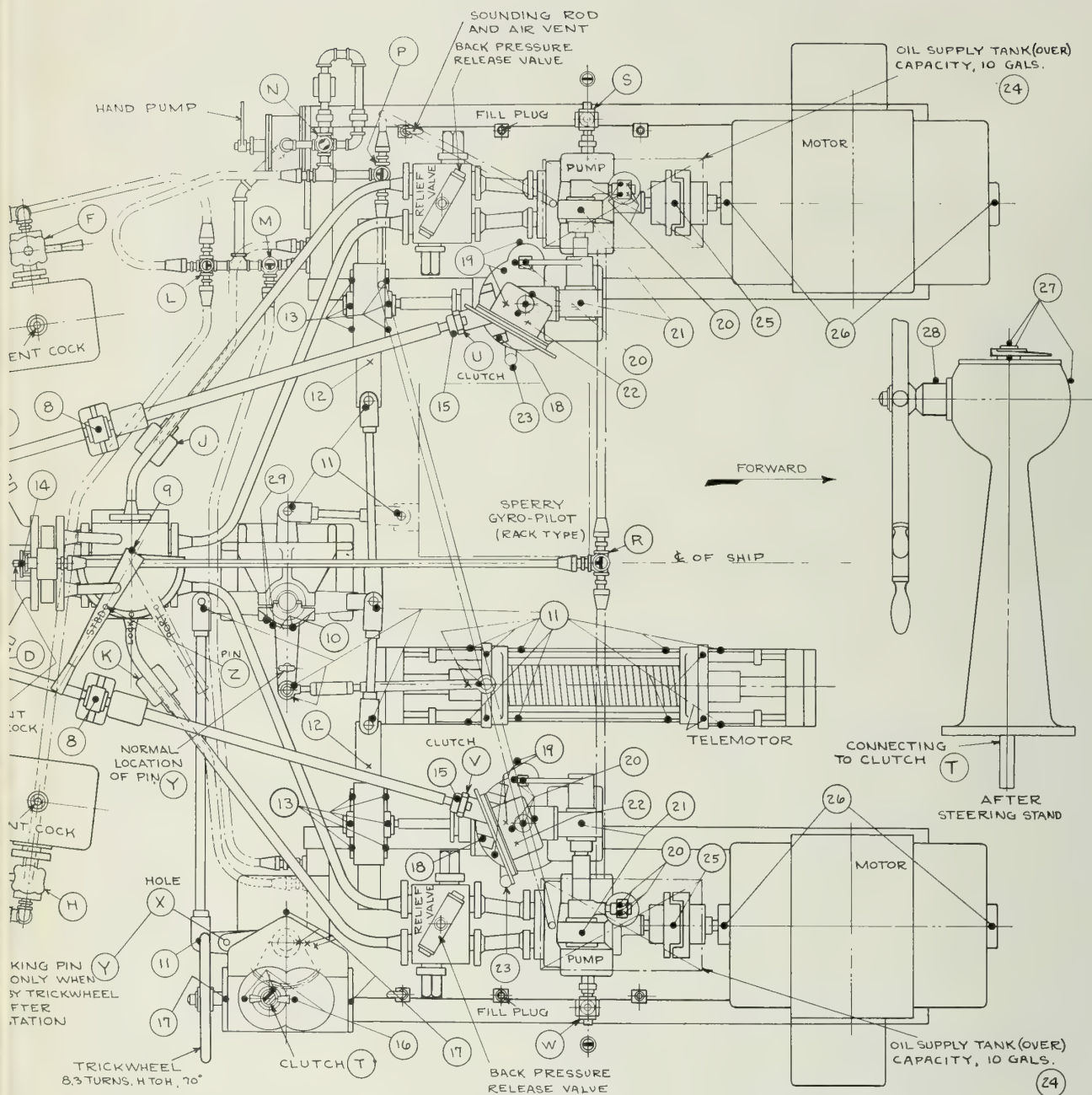
6. Clutches (U) and (V) are to be disengaged only in case of casualty to follow-up mechanism.

7. The rudder can be locked at any angle of its travel by moving transfer valve to position marked "Lock" and inserting pin (Z).



NOTE:-  
RELIEF VALVE SET TO RELIEVE AT 1500 LBS.

LUBRICATING INSTR									
SYMBOL "•" INDICATES THAT PLACE OF APPLICATION IS TO									
SYMBOL "x" INDICATES THAT PLACE OF APPLICATION IS NOT TO BE SEEN									
MARK	PART LUBRICATED	NO PLACES	METHOD	LUBRICANT	APPLICATION	MARK	PART LUBRICATED	NO PLACES	METHOD
1	TIE RODS	8	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	11	LINK PINS & TELEMOTOR GUIDES	23	
2	PLUNGER PIN AND BLOCKS	4	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	12	CONTROL RACK TEETH	2	
3	FOLLOW-UP RACK AND SPUR GEARS	3	BRUSH	GEAR GREASE	DAILY WHEN OPERATING	13	RACK GUIDES & PINION BEARINGS	12	
4	FOLLOW-UP MITER GEARS	2	BRUSH	GEAR GREASE	DAILY WHEN OPERATING	14	VENT PLUG COCK YOKE	1	
5	FOLLOW-UP SPUR GEAR SHAFT BEARINGS	4	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	15	FOLLOW-UP CLUTCH SWIVEL RACE	2	
6	FOLLOW-UP MITER GEAR SHAFT BEARINGS	2	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	16	TRICKWHEEL STAND & WORM SECTOR MITER GEARS & VERTICAL SHAFT BEARING	3	
7	CUT OUT VALVE SPINDLES	4	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	17	TRICKWHEEL STAND WORM & VERTICAL SHAFT BEARINGS & FLOATING LEVER	5	
8	FOLLOW-UP SHAFT INTERMEDIATE BEARING	2	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	18	FOLLOW-UP SHAFT MITER GEAR BEARINGS	2	
9	TRANSFER VALVE SPINDLE BEARING	1	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	19	DIFFERENTIAL CONTROL SLEEVE AND SPINDLE BEARINGS	6	
10	CENTRAL STAND LEVER SHAFT	2	PRESS-URE	GREASE MED GRADE	DAILY WHEN OPERATING	20	RUDDER INDICATOR BEARINGS AND CONTROL ROD PINS	18	



## INSTRUCTIONS

BE SEEN IN VIEW SO MARKED.

IN VIEW SO MARKED, BUT IS ACCESSIBLE AND UNDER "X".

METHOD	LUBRICANT	APPLICATION	MARK	PART LUBRICATED	NO PLACES	METHOD	LUBRICANT	APPLICATION
OIL CAN	OIL SAE No 20	DAILY WHEN OPERATING	21	PUMP CONTROL SHAFT BEARINGS	4	PRESSURE	GREASE MED. GRADE	DAILY WHEN OPERATING
RUSH	GEAR GREASE	DAILY WHEN OPERATING	22	DIFFERENTIAL MITER GEARS	2	BRUSH	GEAR GREASE	DAILY WHEN OPERATING
RESSURE	GREASE MED. GRADE	DAILY WHEN OPERATING	23	DIFFERENTIAL GEAR HOUSING	2	FILL	OIL SAE No 40	KEEP TO OIL LEVEL PROVIDED CHANGE (YEARLY)
OIL CAN	OIL SAE No 20	DAILY WHEN OPERATING	24	HYDRAULIC SYSTEM	2	FILL	OIL SAE No 20	KEEP OIL SUPPLY TANK 3/4 FULL CHANGE (YEARLY)
RUSH	GEAR GREASE	DAILY WHEN OPERATING	25	FLEXIBLE COUPLING	2	PACKED WHEN ASSEMBLED	GREASE MED. GRADE	REPACK DURING OVERHAULING PERIOD (YEARLY)
OIL CAN	OIL SAE No 20	DAILY WHEN OPERATING	26	MOTOR BEARINGS	4	PRESSURE	GREASE MED. GRADE	WEEKLY
RESSURE	GREASE MED. GRADE	DAILY WHEN OPERATING	27	STEERING STAND	7	OIL CAN	OIL SAE No 20	DAILY WHEN OPERATING
RESSURE	GREASE MED. GRADE	DAILY WHEN OPERATING	28	STEERING STAND	1	OIL CUP	OIL SAE No 20	DAILY WHEN OPERATING
OIL CAN	OIL SAE No 20	DAILY WHEN OPERATING	29	TELEMOTOR LEVER	2	PRESSURE	GREASE MED. GRADE	DAILY WHEN OPERATING



## FILLING

The hydraulic system is filled through the supply tanks by means of a hand pump connected to bedplate storage tanks before filling, the following operations are necessary:

1. Open vent plug cock (located over cylinder cutout valves) the stem position (Λ) indicates open, and (V) indicates closed.
2. Open cylinder vent cocks.
3. Check cylinder cutout valves (A) (B) (C) (D) to see that they are open.
4. Check cylinder drain and by-pass valves (E) (F) (G) (H) to see that they are tightly closed. The handles of these valves should be removed to avoid accidental opening.
5. Move transfer valve lever to position indicating selection of either port or starboard unit and start filling the system.
6. When oil appears at the cylinder vent cocks, close them and watch supply tank oil level indicator.
7. When oil appears at supply tank, throw power unit transfer valve lever to other power unit and continue filling until both supply tanks are about  $\frac{3}{4}$  full. Keep supply tanks about  $\frac{3}{4}$  full, taking care to prevent foreign matter from entering the system. In case of casualty to one of the supply tanks, the faulty tank may be cut out and the other tank used exclusively by means of plug cock (R).
8. The supply tanks may be filled by means of the hand pump from the bedplate tanks, plug cock (P) controlling the discharge to both tanks, or either tank separately. The oil filter should always be used when filling supply tanks by hand pump, or when filling cylinders by hand pump.

### VALVE AND COCK INSTRUCTIONS

**CARE MUST BE TAKEN TO ASSURE PROPER POSITIONS  
OF VALVES AND COCKS BEFORE ANY OPERATION IS STARTED.**

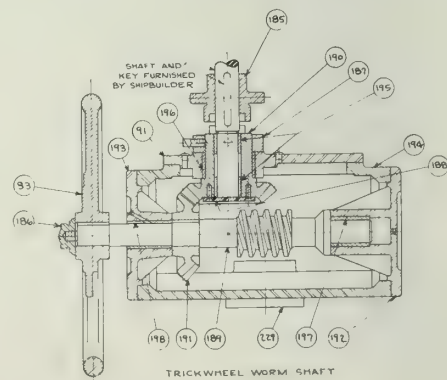
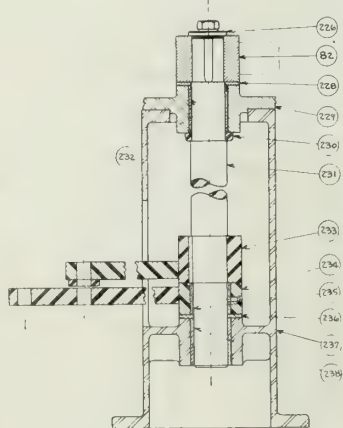
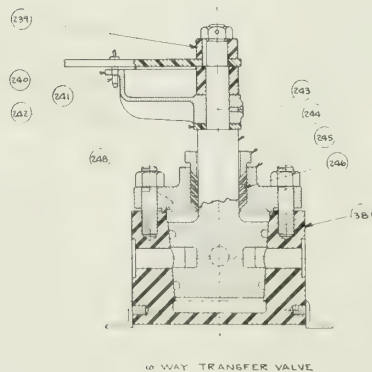
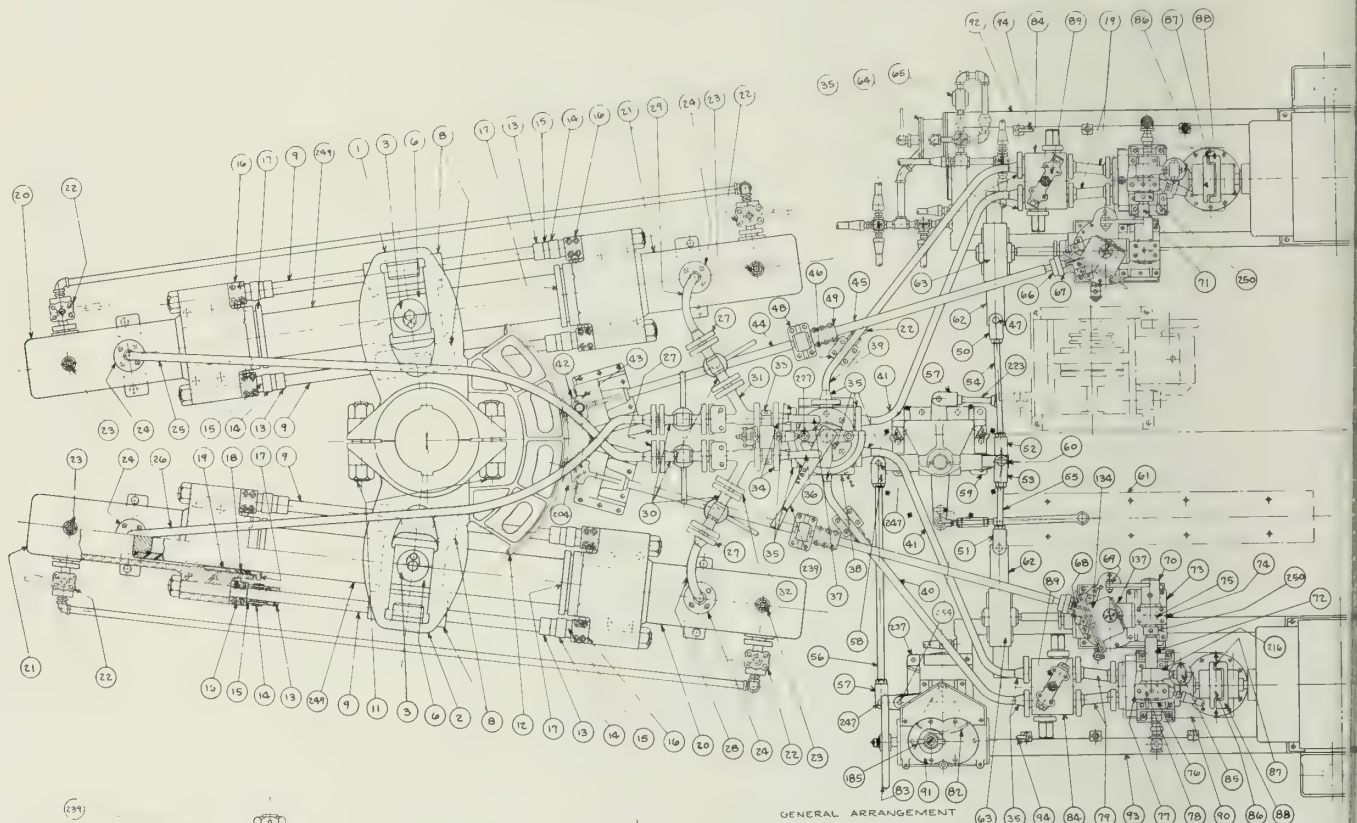
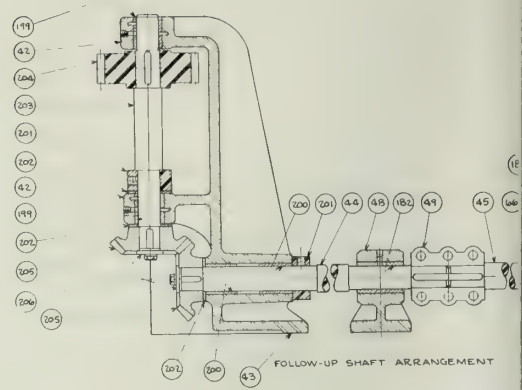
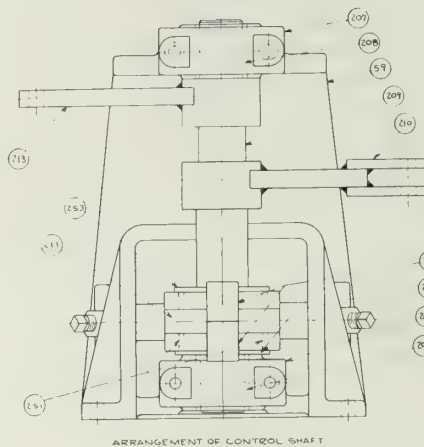
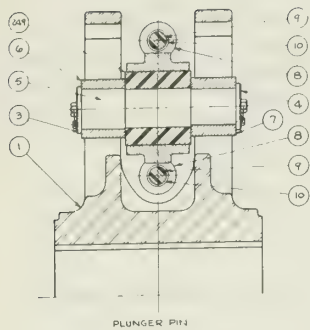
OPERATION	REQUIRED POSITIONS OF VALVES AND COCKS FOR RESPECTIVE OPERATIONS																	
	CYLINDER CUTOUT VALVES				CYLINDER DRAIN AND BY-PASS VALVES				MAIN PIPING DRAIN VALVES		FILL& DRAIN COCKS							
	(A)	(B)	(C)	(D)	(E)	(F)	(G)	(H)	(J)	(K)	(L)	(M)	(N)	(P)	(R)	(S)	(W)	
NORMAL STEERING WITH PORT AND STBD. CYL'S.	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED	CLOSED								
STEERING WITH PORT CYL'S STBD CYL'S. BY-PASSING	OPEN	CLOSED	OPEN	CLOSED	CLOSED	CLOSED	OPEN	OPEN	CLOSED	CLOSED								
STEERING WITH STBD CYL'S. PORT CYLS. BY-PASSING	CLOSED	OPEN	CLOSED	OPEN	OPEN	OPEN	CLOSED	CLOSED	CLOSED	CLOSED								
DRAINING CYL'S, MAIN PIPING & MAIN PUMPS BY GRAVITY	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN								
DRAINING CYL'S. BY HAND PUMP	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED								
FILLING CYL'S. BY HAND PUMP	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	OPEN	CLOSED	CLOSED								

PLUG COCK (M) BEDPLATE TANK SUCTION OR DRAIN
BOTH TANKS
PORT TANK
STBD. TANK

PLUG COCK (N) OIL FILTER
OPERATING
BY-PASSED

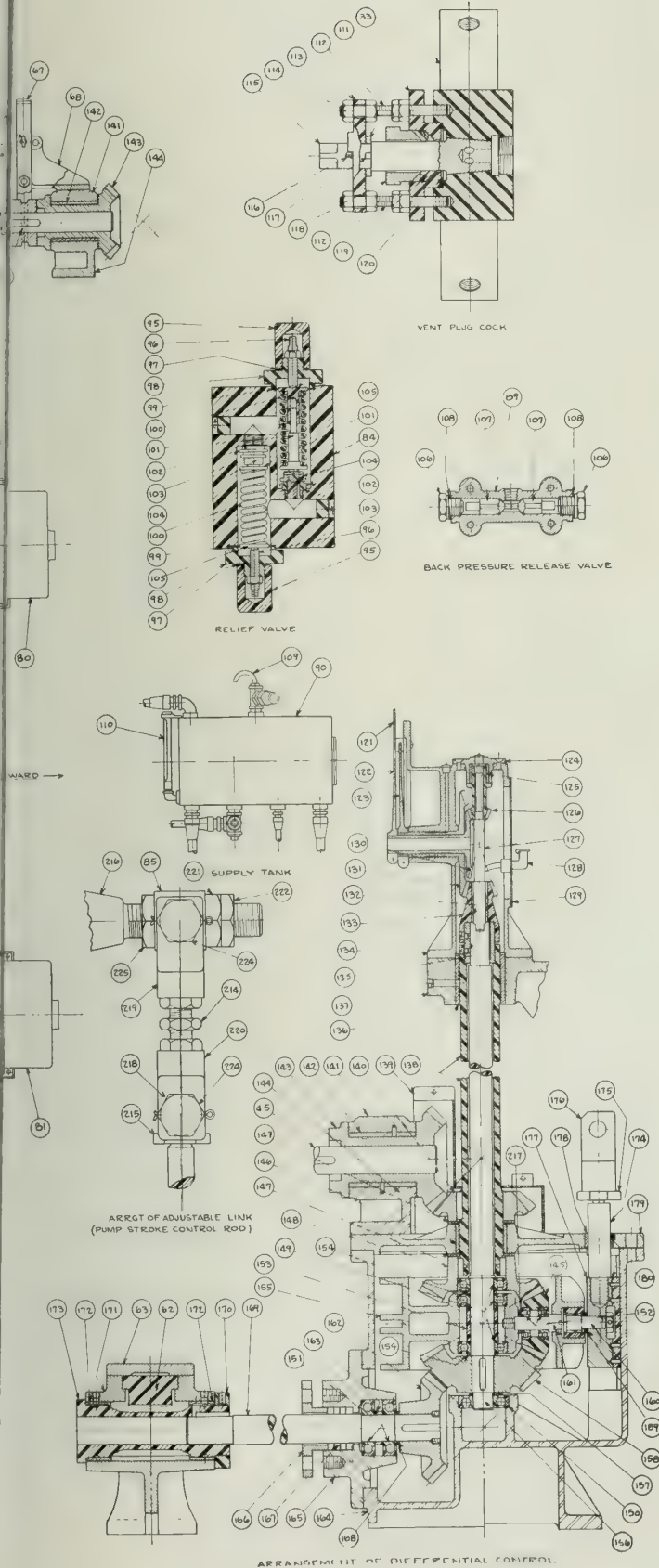
PLUG COCK (P) HAND PUMP TO SUPPLY TANK
BOTH TANKS
PORT TANK
STBD. TANK

PLUG COCK (R) SUPPLY TANKS OPERATING
BOTH TANKS
PORT TANK
STBD. TANK





# LIST OF PARTS — STEERER ILLUSTRATED PAGE 1

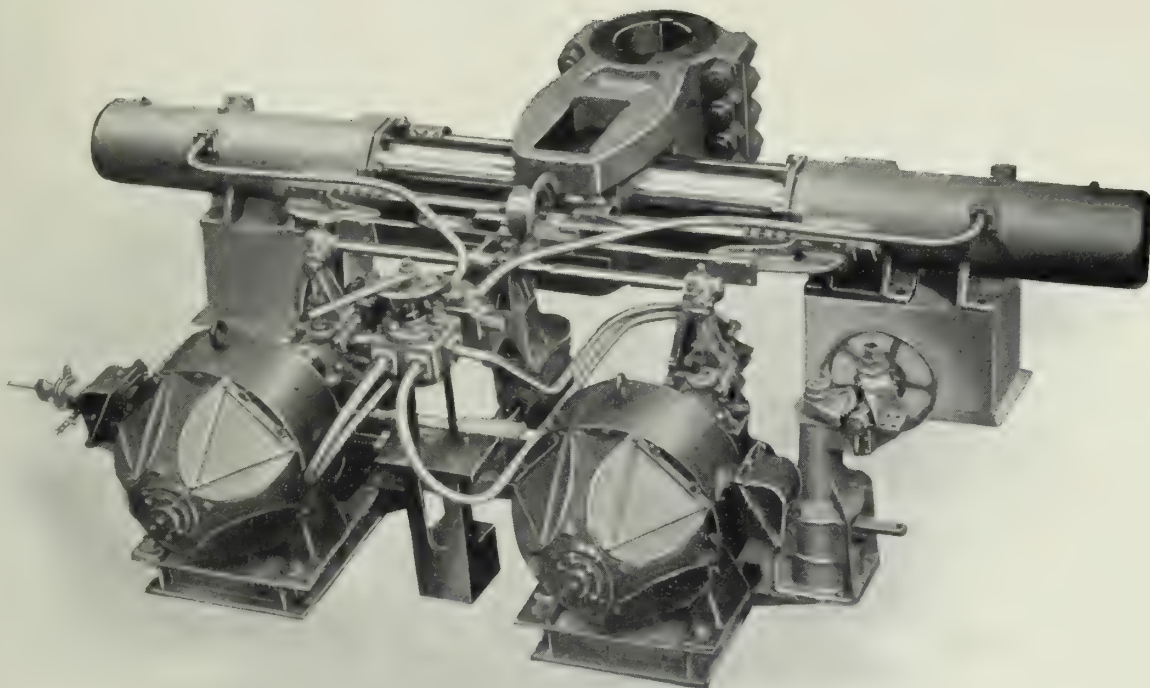


1. TILLER (HALF)
2. TILLER (HALF)
3. TOP PLUNGER PIN CAP
4. BOTTOM PLUNGER PIN CAP
5. PLUNGER PIN
6. TOP TILLER BLOCK
7. BOTTOM TILLER BLOCK
8. PLUNGER GUIDE AND STOP
9. TIE ROD
10. BUSHING
11. TILLER STUD BOLT
12. FOLLOW-UP SECTOR
13. FLANGED STOP
14. CRUSHING PIECE RETAINER
15. CRUSHING PIECE
16. SPLIT COLLAR
17. PACKING GLAND
18. PACKING RING
19. BUSHING
20. CYLINDER
21. CYLINDER
22. CYLINDER DRAIN VALVE
23. PLUG AND AIR COCK
24. FLANGE
25. PIPE
26. PIPE
27. FLANGE
28. PIPE
29. PIPE
30. VALVE (HOMESTEAD CO.)
31. REDUCING LATERAL
32. REDUCING LATERAL
33. VENT PLUG COCK
34. FLANGE
35. FLANGE
36. PIPE
37. PIPE
38. 6-WAY TRANSFER VALVE
39. PIPE
40. PIPE
41. PIPE
42. FOLLOW-UP PINION BEARING CAP
43. FOLLOW-UP PINION BEARING
44. MITER GEAR SHAFT
45. FOLLOW-UP SHAFT
46. DRAIN VALVE FLANGE
47. LINK PIN
48. FOLLOW-UP SHAFT INTERMEDIATE BEARING
49. CLAMP COUPLING
50. KNUCKLE (R. H. TH'D)
51. KNUCKLE (R. H. TH'D)
52. KNUCKLE (L. H. TH'D)
53. KNUCKLE (L. H. TH'D)
54. CONN. LINK ROD
55. CONN. LINK ROD
56. CONN. LINK ROD
57. KNUCKLE (L. H. TH'D)
58. KNUCKLE (R. H. TH'D)
59. CENTRAL CONTROL STAND
60. LINK PIN
61. TELEMOTOR BEDPLATE (SEE TELEMOTOR LIST OF PARTS)
62. CONTROL RACK
63. CONTROL RACK STAND COVER
64. HAND PUMP (DEMING NO. 3)
65. OIL FILTER (CUNO)
66. CLUTCH
67. CLUTCH LEVER
68. CLUTCH LEVER BEARING
69. CONTROL LINKS
70. DIFFERENTIAL LEVER
71. PUMP CONTROL SHAFT (PORT)
72. PUMP CONTROL SHAFT (STARBOARD)
73. CONTROL SHAFT BEARING
74. CONTROL SHAFT BEARING CAP
75. BEARING BOX
76. PUMP CONTROL SHAFT BEARING
77. PUMP CONTROL SHAFT BEARING CAP
78. BEARING BOX
79. FITTING
80. PORT MOTOR
81. STARBOARD MOTOR
82. WORM SECTOR
83. TRICKWHEEL
84. RELIEF VALVE BODY



## LIST OF PARTS (Continued)

- |  |   |
|--|---|
| 85. KNUCKLE BLOCK (UPPER)                    | 170. COLLAR                                 |
| 86. COUPLING HALF (PUMP END)                 | 171. CONTROL RACK STAND                     |
| 87. COUPLING CENTER MEMBER                   | 172. BUSHING                                |
| 88. COUPLING HALF (MOTOR END)                | 173. SLEEVE PINION                          |
| 89. BACK PRESSURE RELEASE VALVE BODY         | 174. DIFFERENTIAL CONTROL SPINDLE           |
| 90. SUPPLY TANK                              | 175. LOCKNUT                                |
| 91. WORM SECTOR CASING COVER                 | 176. DIFF. CONTROL ROD KNUCKLE              |
| 92. PORT BEDPLATE                            | 177. DIFF. CONTROL SLIDE                    |
| 93. STARBOARD BEDPLATE                       | 178. BUSHING                                |
| 94. VENT PLUG                                | 179. DIFF. GEAR HOUSING COVER               |
| 95. ADJUSTING SCREW CAP                      | 180. SQUARE FEATHER KEY                     |
| 96. ADJUSTING SCREW                          | 181. BEARING BOX                            |
| 97. GASKET                                   | 182. BUSHING                                |
| 98. RELIEF VALVE COVER                       | 183. TOGGLE PIN                             |
| 99. GASKET                                   | 184. CLUTCH SWIVEL                          |
| 100. RELIEF VALVE SPRING                     | 185. CLUTCH                                 |
| 101. VALVE SPRING SEAT (VALVE END)           | 186. TRICKWHEEL NUT                         |
| 102. RELIEF VALVE SEAT                       | 187. COLLAR                                 |
| 103. GASKET                                  | 188. VERTICAL SHAFT CAP                     |
| 104. RELIEF VALVE                            | 189. WORM SHAFT                             |
| 105. VALVE SPRING SEAT (SCREW END)           | 190. MITER GEAR (CLUTCH END)                |
| 106. SPECIAL PLUG                            | 191. MITER GEAR                             |
| 107. SHUTTLE VALVE                           | 192. WORM SHAFT BEARING                     |
| 108. GASKET                                  | 193. WORM SHAFT BEARING                     |
| 109. SUPPLY TANK VENT PLUG                   | 194. WORM SECTOR CASING (UPPER HALF)        |
| 110. OIL LEVEL INDICATOR (GITS BROS.)        | 195. BUSHING                                |
| 111. STUFFING BOX                            | 196. BUSHING                                |
| 112. VENT PLUG STANCHION                     | 197. BUSHING                                |
| 113. YOKE                                    | 198. BUSHING                                |
| 114. COLLAR                                  | 199. BEARING BOX                            |
| 115. PLUG                                    | 200. BUSHING                                |
| 116. SCREW PIN                               | 201. COLLAR                                 |
| 117. SQUARE HEAD PIN KEY                     | 202. COLLAR                                 |
| 118. GLAND                                   | 203. SPUR GEAR SHAFT                        |
| 119. PACKING RING                            | 204. FOLLOW-UP PINION                       |
| 120. GASKET                                  | 205. FOLLOW-UP MITER GEAR                   |
| 121. INDICATOR SCALE                         | 206. SHAFT CAP                              |
| 122. HELM POINTER                            | 207. CENTRAL CONTROL STAND CAP              |
| 123. RUDDER POINTER                          | 208. BEARING BOX                            |
| 124. CAP BEARING                             | 209. CONTROL SHAFT                          |
| 125. BUSHING                                 | 210. CONTROL RACK LEVER                     |
| 126. HELM INDICATOR PINION                   | 211. SPERRY G. P. & TELEMOTOR LEVER         |
| 127. DIFF. CONTROL SHAFT EXTENSION           | 212. COLLAR                                 |
| 128. OIL CUP (GITS BROS.)                    | 213. TRICKWHEEL STAND LEVER                 |
| 129. COVER                                   | 214. PUMP CONT. LINK ADJ. SCREW & LOCK NUTS |
| 130. HELM INDICATOR GEAR                     | 215. LOCKNUT                                |
| 131. RUDDER INDICATOR GEAR                   | 216. PUMP CONTROL LEVER                     |
| 132. BUSHING                                 | 217. DISTANCE PIECE                         |
| 133. RUDDER INDICATOR PINION                 | 218. KNUCKLE BLOCK (LOWER)                  |
| 134. HELM AND RUDDER INDICATOR STAND         | 219. KNUCKLE (UPPER)                        |
| 135. BUSHING                                 | 220. KNUCKLE (LOWER)                        |
| 136. BUSHING                                 | 221. PUMP STROKE ADJ. NUT                   |
| 137. DIFF. CONTROL SHAFT BEARING             | 222. PUMP STROKE LOCKNUT                    |
| 138. DIFF. FOLLOW-UP CONTROL SLEEVE          | 223. LINK ROD (FURNISHED BY SHIPBUILDER)    |
| 139. DIFF. CONTROL GEAR GUARD                | 224. KNUCKLE SWIVEL BOLT                    |
| 140. DIFF. CONTROL MITER GEAR                | 225. PUMP STROKE ADJ. SLEEVE NUT            |
| 141. FOLLOW-UP MITER GEAR BEARING CAP        | 226. SHAFT CAP                              |
| 142. BEARING BOX                             | 227. TRANSFER VALVE YOKE STANCHION          |
| 143. FOLLOW-UP MITER GEAR (CLUTCH HALF)      | 228. THRUST COLLAR                          |
| 144. FOLLOW-UP MITER GEAR BEARING            | 229. WORM SECTOR CASING (LOWER HALF)        |
| 145. BEVEL PINION                            | 230. COLLAR                                 |
| 146. BUSHING                                 | 231. WORM SECTOR SHAFT                      |
| 147. COLLAR                                  | 232. BUSHING                                |
| 148. BEVEL GEAR                              | 233. TRICKWHEEL STAND LEVER (FIXED)         |
| 149. BALL BEARING SKF NO. 6206               | 234. TRICKWHEEL STAND FLOATING LEVER        |
| 150. BALL BEARING SKF NO. 6305               | 235. BUSHING                                |
| 151. BALL BEARING SKF NO. 6207               | 236. THRUST COLLAR                          |
| 152. BALL BEARING SKF NO. 6203               | 237. TRICKWHEEL STAND                       |
| 153. DISTANCE PIECE                          | 238. BUSHING                                |
| 154. DISTANCE PIECE                          | 239. VALVE LEVER                            |
| 155. PUMP CONTROL ROLLER RACE                | 240. YOKE                                   |
| 156. DIFFERENTIAL CONTROL SHAFT              | 241. LOCKING PIN                            |
| 157. DISTANCE PIECE                          | 242. COLLAR                                 |
| 158. MITER AND BEVEL GEAR                    | 243. PLUG                                   |
| 159. COLLAR                                  | 244. GLAND                                  |
| 160. ROLLER BEARING AND PIN                  | 245. STUFFING BOX AND COVER                 |
| 161. DIFFERENTIAL PINION PIN                 | 246. PACKING                                |
| 162. MITER GEAR                              | 247. LINK PIN                               |
| 163. DISTANCE PIECE                          | 248. GASKET                                 |
| 164. DIFFERENTIAL GEAR HOUSING               | 249. PLUNGER                                |
| 165. CONTROL PINION BEARING STUFFING BOX     | 250. COLLAR                                 |
| 166. CONT. PINION BEARING STUFFING BOX GLAND | 251. BUSHING                                |
| 167. PACKING RING                            | 252. TELEMOTOR LEVER                        |
| 168. DISTANCE PIECE                          | 253. COLLAR                                 |
| 169. CONTROL PINION SHAFT                    | 254. LINK PIN                               |



### **TWO CYLINDER TYPE HYDRO ELECTRIC STEERING GEAR**

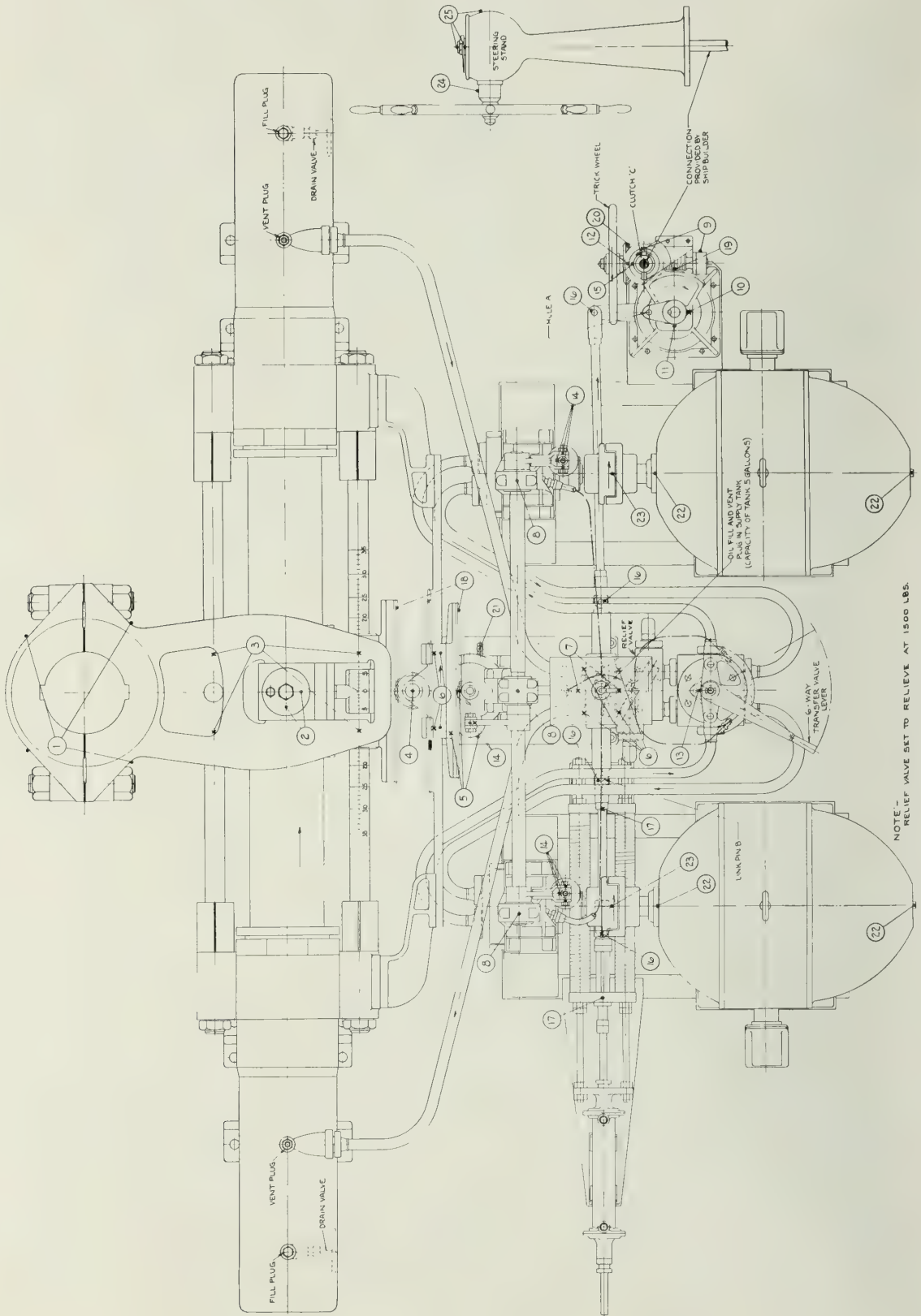
The power unit consists of two motors driving two Waterbury pumps at constant speed with a six-way valve cock interposed in the piping between pump and ram cylinders. This six-way cock is lever operated and serves as a means of changing over from one pumping unit to the other, also allows for by-passing the liquid from one cylinder to the other in case the emergency steering gear is to be used.

The ram unit consists of a double ended ram and two cylinders, connecting to a forked tiller with sliding blocks to forged pin in center of ram.

A relief valve is located in the piping between the six-way cock and plunger cylinders. This relief valve is set to release at 1500 lbs. per square inch and relieves to low pressure side of line.

The Hydraulic Telemotor is used to control the direction and angular travel of the rudder through Steering Gear. The Telemotor Receiver is connected through a differential to stroke the pump. Then mechanism from tiller or ram through differential returns stroke of pump to neutral position.

## HYDRO ELECTRIC STEERING GEAR



RELIEF VALVE SET TO RELIEVE AT 1500 LBS.



# INSTRUCTIONS FOR STEERER ILLUSTRATED ON PAGE 9 AND SHOWN ON PAGE 10

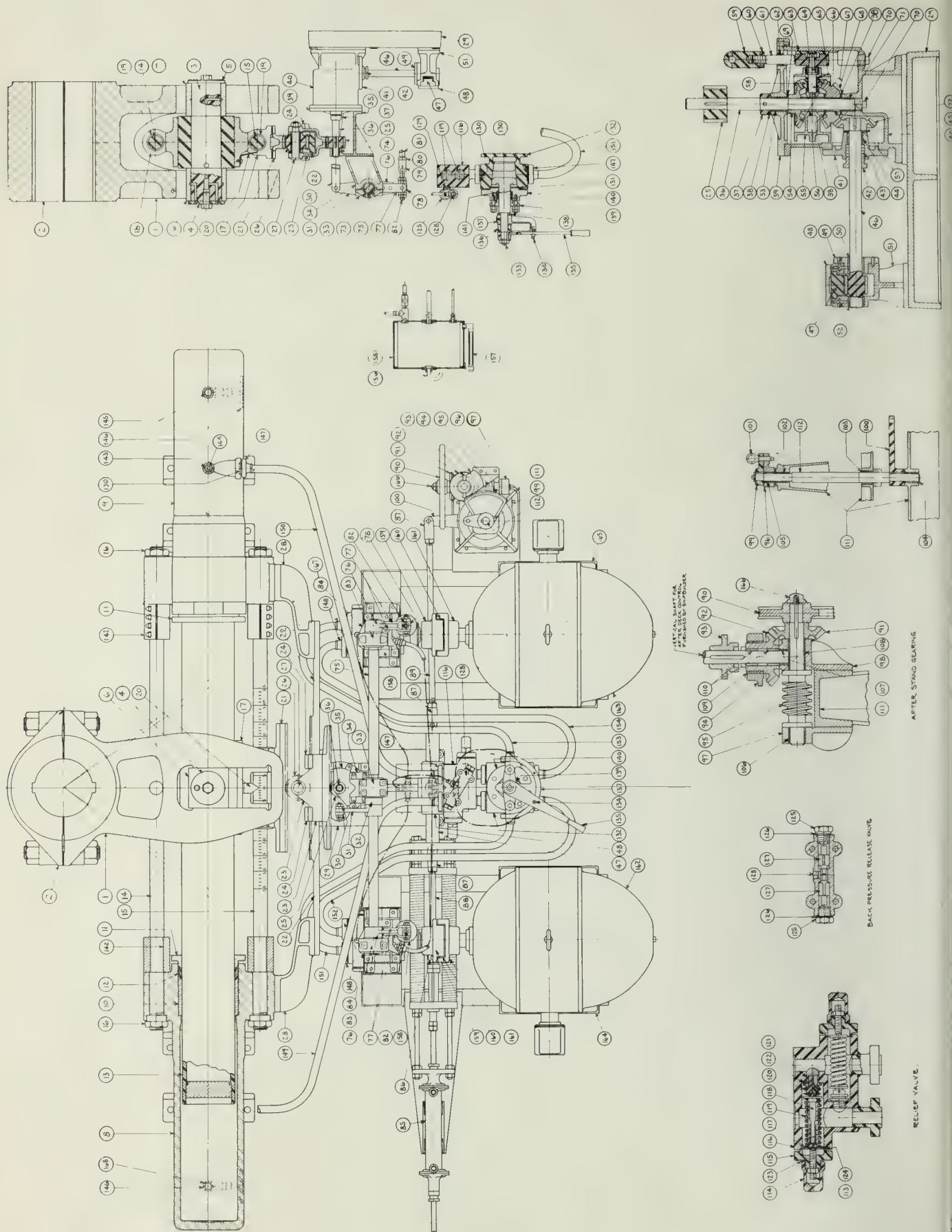
1. To fill the cylinders, remove vent and fill plugs. Remainder of hydraulic system to be filled by removal of oil plug in top of supply tank. When filling through supply tank, the transfer valve lever should be to starboard for filling starboard pump and to port for filling port pump.
2. Keep oil supply tank three-fourths full. Care is to be taken to prevent foreign matter from entering system.
3. Handles of cylinder drain valves should be removed to prevent accidental opening.
4. Telemotor control is used for normal steering. (See telemotor instructions.)
5. For steering by trickwheel, insert locking pin in hole "A" and remove link pin "B". (Locking pin is normally carried in holder on trickwheel stand.)
6. For steering from after steering stand, locking pin is to be in hole "A" and link pin "B" removed. As for trick wheel steering, but with clutch "C" engaged. (Clutch "C" is to be engaged only for steering from after steering stand.)
7. To use either port or starboard power unit, put transfer valve to side selected and start corresponding motor.
8. To change from one power unit to the other, start other motor and when steering gear is in a followed up position, throw transfer valve lever to other side.

## LUBRICATION INSTRUCTIONS

Symbol ● indicates that place of application may be seen in view so marked.  
Symbol × indicates that place of application is not in sight in view so marked but is accessible and under ×.

Mark	Part Lubricated	No. Places	Method	Lubricant	Application
1	Rudder Thrust Bearing	4	Pressure	grease "Med. Grade"	Daily when operating
2	Plunger Pin and Plunger Pin Blocks	2	"	"	" " " "
3	Tie Rods	4	"	"	" " " "
4	Follow-up Pinion Pin	1	"	"	" " " "
5	Differential Shaft Bearings and Differential Spindle Bearing	3	"	"	" " " "
6	Rack Guides	8	"	"	" " " "
7	Control Pinion Shaft Bearings	2	"	"	" " " "
8	Pump Control Shaft Bearings	3	"	"	" " " "
9	Trickwheel Worm Shaft Bearings	2	"	"	" " " "
10	Telemotor Lever Shaft Bearings	2	"	"	" " " "
11	Worm Sector	1	"	"	" " " "
12	Trick Wheel Miter Gear Bearing	1	"	"	" " " "
13	Transfer Valve Spindle Bearing	1	"	"	Weekly
14	Control Knuckles and Levers	8	Oil Can	Oil S.A.E. No. 20	Daily when operating

Mark	Part Lubricated	No. Places	Method	Lubricant	Application
15	Vertical Shaft Bearings	1	Oil Can	Oil S.A.E. No. 20	Daily when operating
16	Telemotor Link Pins	4	"	"	" " " "
17	Telemotor Piston Rod	2	"	"	" " " "
18	Follow-up Racks	3	Brush	Gear Grease	" " " "
19	Trickwheel Worm and Sector	1	"	"	" " " "
20	Trickwheel Miter Gears	1	"	"	" " " "
21	Differential Gear Housing	1	Fill	Oil S.A.E. No. 40	Keep to oil level provided (change yearly)
22	Motor Ball Bearings	4	Pressure	Grease "Med. Grade"	Weekly
23	Flexible Couplings	2	Backed when Assembled	"	Repack during overhauling period (yearly)
24	Steering Stand	1	Oil Cup	Oil S.A.E. No. 20	Daily when operating
25	Steering Stand	4	Oil Can	"	" " " "
26	Hydraulic System		Fill	Oil S.A.E. No. 20	Keep oil supply tank 3/4 full (change yearly)



1. TILLER	57. BUSHING	113. ADJUSTING SCREW, RELIEF VALVE
2. TILLER CAP	58. DIFFERENTIAL PINION	114. ADJUSTING SCREW CAP
3. PLUNGER PIN	59. DIFFERENTIAL CONTROL ROD KNUCKLE	115. RELIEF VALVE COVER
4. PLUNGER PIN CAP, TOP	60. LOCKNUT	116. RELIEF VALVE BODY
5. PLUNGER PIN CAP, BOTTOM	61. DIFFERENTIAL CONTROL SPINDLE	117. VALVE SPRING SEAT
6. TILLER BLOCK	62. BUSHING	118. VALVE SPRING SEAT
7. TILLER BLOCK	63. KEY	119. VALVE SPRING
8. STARBOARD CYLINDER	64. ROLLER BEARING AND PIN	120. RELIEF VALVE
9. PORT CYLINDER	65. THRUST COLLAR	121. RELIEF VALVE SEAT
10. CYLINDER BUSHING	66. BUSHING	122. GASKET
11. CYLINDER GLAND	67. DIFFERENTIAL PINION PIN	123. GASKET
12. CYLINDER PACKING	68. DOUBLE BEVEL GEAR	124. GASKET
13. PLUNGER	69. THRUST COLLAR	125. SPECIAL PLUG
14. TIE ROD, AFT	70. PLUG	126. GASKET
15. TIE ROD, FORWARD	71. BUSHING	127. BACK PRESSURE RELEASE VALVE
16. TIE ROD NUT	72. MITRE GEAR	128. BACK PRESSURE RELEASE VALVE BODY
17. TIE ROD BEARING, FORWARD	73. BEARING BOX	129. GASKET
18. TIE ROD BEARING, AFT	74. BUSHING	130. GASKET
19. TIE ROD BEARING BUSHING	75. PUMP CONTROL SHAFT	131. GASKET
20. RUDDER ANGLE POINTER	76. PUMP CONTROL LEVER	132. 6-WAY TRANSFER VALVE BODY
21. FOLLOW-UP RACK	77. PUMP CONTROL LEVER, BLOCK END	133. 6-WAY TRANSFER VALVE PLUG
22. FIXED RACK	78. PUMP CONTROL LEVER BLOCK	134. LOCKING PIN
23. DIFFERENTIAL RACK	79. PUMP ROD CONTROL KNUCKLE	135. TRANSFER VALVE LEVER
24. DIFFERENTIAL RACK COVER	80. LOCKNUT	136. DISTANCE PIECE
25. DIFFERENTIAL RACK PINION	81. PUMP STROKE CONTROL ROD	137. YOKE
26. FOLLOW-UP RACK PINION	82. ADJUSTING BOLT	138. COLLAR
27. FOLLOW-UP PINION PIN	83. BEARING CAP	139. GLAND
28. FIXED RACK BRACKET	84. BEARING	140. COVER AND STUFFING BOX
29. CONTROL UNIT BEDPLATE	85. TELEMOTOR	141. PACKING
30. CONTROL LINKS	86. KNUCKLE	142. SPLIT COLLAR (2 PIECES)
31. DIFFERENTIAL LEVER	87. KNUCKLE	143. VENT PLUG
32. DISTANCE PIECE	88. CONNECTING LINK	144. AIR COCK
33. CONTROL SHAFT BEARING CAP	89. CONNECTING LINK	145. PRESSURE GAUGE ADAPTER
34. CONTROL SHAFT BEARING	90. 18" STEERING WHEEL	146. DRAIN VALVE
35. CONTROL SHAFT BEARING BRACKET	91. MITRE GEAR	147. PIPE FLANGE
36. DIFFERENTIAL CONTROL SHAFT	92. MITRE GEAR	148. PIPE FLANGE (WATERBURY TOOL CO.)
37. COLLAR	93. CLUTCH	149. PIPE
38. THRUST COLLAR	94. MITRE GEAR BEARING	150. PIPE
39. DIFFERENTIAL GEAR HOUSING COVER	95. WORM AND SHAFT	151. PIPE
40. DIFFERENTIAL GEAR HOUSING	96. WORM SECTOR	152. PIPE
41. BEARING AND STUFFING BOX	97. WORM SHAFT BEARING, SHORT	153. PIPE
42. GLAND	98. WORM SHAFT BEARING, LONG	154. PIPE
43. PACKING	99. 4" LEVER	155. OIL SUPPLY TANK
44. BUSHING	100. 12" LEVER	156. AIR VENT AND FILL PLUG
45. THRUST COLLAR	101. LOCKING PIN	157. OIL LEVEL INDICATOR
46. CONTROL PINION AND SHAFT	102. BUSHING	158. PUMP (SEE WATERBURY TOOL CO. LIST)
47. CONTROL RACK	103. BUSHING	159. COUPLING HALF (PUMP END)
48. CONTROL RACK STAND COVER	104. BUSHING	160. COUPLING CENTER MEMBER
49. CONTROL PINION SHAFT BEARING	105. BUSHING	161. COUPLING HALF (MOTOR END)
50. BUSHING	106. BUSHING	162. STARBOARD MOTOR
51. CONTROL RACK STAND	107. BUSHING	163. PORT MOTOR
52. BUSHING	108. BUSHING	164. STARBOARD POWER UNIT BEDPLATE
53. BUSHING	109. BUSHING	165. PORT POWER UNIT BEDPLATE
54. BEVEL GEAR	110. BUSHING	166. SPECIAL NUT
55. PUMP CONTROL ROLLER RACE	111. AFTER STAND	167. BEARING BOX
56. BUSHING	112. AFTER STAND SHAFT	168. DRAIN VALVE ADAPTER



## FILL HYDRAULIC SYSTEM WITH OIL SAE 20

### MANUFACTURERS' RECOMMENDATIONS

	SP. Grav.	Cold Test	Flash Point	Fire Point	Viscosity S.S.U. — F°			
					100	130	140	210
Atlantic Refining Co. Turbine Oil — Heavy . . . . .	.879	10°	425	485	290		120	53
Cities Service Refining Co. North Star No. 5 . . . . .	.930	0°	340	390	300	138		48
Gulf Refining Co. Gulf Crest C . . . . .	.879	10°	420	480	300	140		52
E. F. Houghton & Co. Cosmolubric Med. Heavy Refrig.	.912	—30°	380	440	310		116	50
Sinclair Refining Co. Rubilene <del>Med.</del> Light Med. . . . .	<del>.907</del> .903	10°	<del>410</del> 415	<del>505</del> 480	<del>305</del> 310	<del>130</del> 147	142	<del>51</del> 52
Socony-Vacuum Corp. Gargoyle D.T.E. Heavy Med. . . . .	.905	10°	390	445	320	143	118	50
Standard Oil Co., Indiana Stanolind Turbine Oil, Heavy . . . . .	.900	40°	410	465	350	165	136	56
Standard Oil Co., N. J., Pa., La. & Colonial Beacon — Teresso 52 . . . . .	.884	25°	440	490	320	150	125	52
Texas Company Regal Oil C . . . . .	.922	0°	375	430	317	138		47
Tide Water Oil Co. Tycol Heavy Medium . . . . .	.896	10°	430	490	300		118	52





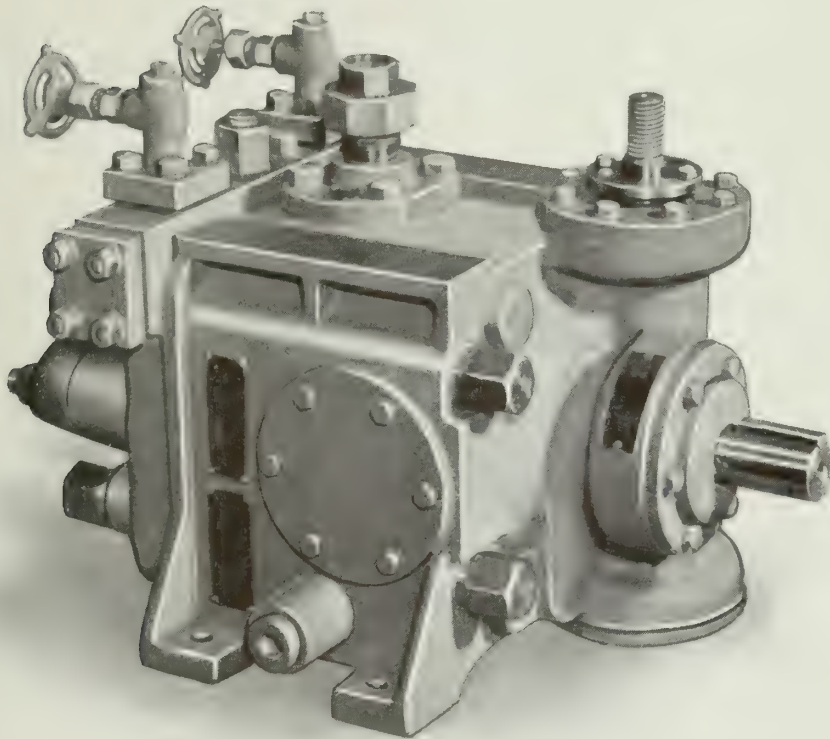


# VARIABLE DELIVERY PUMP

BUILT BY

## WATERBURY TOOL

DIVISION OF VICKERS INCORPORATED  
WATERBURY, CONN.



SPECIFIED AS STANDARD EQUIPMENT  
FOR  
HYDRO ELECTRIC STEERING GEAR

HYDE WINDLASS COMPANY  
BATH, MAINE

No. 23

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## DESCRIPTION OF UNIT

The pumps built by The Waterbury Tool Division of Vickers Incorporated are of the rotary variable displacement type with axially disposed pistons.

## HOW THE PUMP OPERATES

Referring to the pump, or A-End, cut on cover and section view on page 4, when the tilting box and its socket ring are set at neutral position, that is, perpendicular to the shaft, rotation of the shaft will carry around with it the socket ring, cylinder barrel, pistons, and connecting rods, but the pistons will not reciprocate or move to and fro in the cylinders. There will therefore be no drawing of oil into or forcing it out of the valveplate, and the pump is said to be at neutral.

If now the control shaft is moved a little so as to move the top of the tilting box away from the valveplate, with the A-shaft rotating the top away from the observer, all the pistons as they move down on the far side of the machine, will force oil in through the port in the far side of the valveplate. Likewise, all the pistons, as they move up on the near side, will slide away from the valveplate and suck oil through the port in the near side of the valveplate. The far port will thus be under pressure while the near port is in suction.

It is noticed that when any piston is on top or bottom dead center it makes no endwise motion, and at this time is over the land or space between the valveplate ports, this land thus separating the high and low pressure.

It can now be readily seen that the amount of oil pumped is in proportion to the angle of the tilting box from neutral. Also, that if the tilting box were tilted toward the valveplate, the A-shaft rotating as before, the movement of oil through the valveplate ports would be reversed.

## FILLING WITH OIL

A hydraulic power system functions at its best when entirely filled with oil and free as possible from air. For this reason, filling of the system requires considerable care and attention.

First, it is necessary to open both needle valves on top of valveplate, or if these are connected to gauges, break the piping temporarily. Pour the oil through the filter into the oil expansion box until it appears at the needle valves.

Entry of air at time of filling cannot be entirely prevented. It can, however, be materially reduced by adding make-up oil very slowly. Strain oil through a fine mesh wire screen (120 mesh) as it is poured into the system. Surfaces around filler openings should be wiped and cleaned of dirt and grit before plugs are removed.

The connecting pipes between the pump and rams must be provided with plugs at highest point, in order to clear the active system from air. These should be manipulated a few times to clear all air from the system. Before closing the needle valves on the valveplate, give the shaft a few turns in each direction to force the air out of the cylinders and valveplate ports, maintaining the oil level in the oil expansion box during this time. It will be necessary to remove the air plugs in the highest points in the oil system from time to time during this procedure in order to let air escape.

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Finally, there must be no air in the system; but it may be impossible to get it all out before running the pump under power. The pump should be run a few minutes and then stopped.

The oil expansion box should be about two-thirds full of oil at all times.

### **AIR IN THE HYDRAULIC SYSTEM**

Presence of air in the pump is usually accompanied by one or more of the following symptoms:

1. Noisy Operation
2. Variation of speed of hydraulic ram, especially slowing down under load, without change in pump stroke.

If, after following the above instructions, there are still indications of air in the system, it will be advisable to operate the pump for twenty or thirty minutes at short stroke and high pressure. The air will be forced out of the active system into the case and will vent to the expansion tank.

### **CARE AND OPERATION**

**CLEANLINESS** — It is absolutely necessary that every precaution be taken to keep out all dirt and gritty material, both in assembling the pump and in filling with oil.

Take special care during installation to remove all scale, sand and foreign matter from piping.

Avoid mixing mineral with animal or vegetable oils.

DO NOT use steam cylinder oil.

DO NOT MIX together two different brands of oil, as they may cause a gummy deposit to form on the parts. If such a deposit collects on the replenishing valves, it will prevent their closing properly.

**OPENING FOR INSPECTION** As long as a machine operates satisfactorily it should not be opened. Experience has shown that machines give the best service when they are not disturbed.

### **OIL**

#### **For Waterbury Hydraulic Variable Delivery Pumps**

The following Navy specification oils are recommended for use in Waterbury Pumps:

For Summer Use	Navy Spec. 2135
For Winter Use	In exposed locations Navy Spec. 2110
For All Weather Use	Navy Department, Bureau of Ordnance — Spec. 1113
For all applications using Hydraulic Control Mechanisms	Navy Department, Bureau of Ordnance — Spec. 1113

For continuous duty change oil every six months.



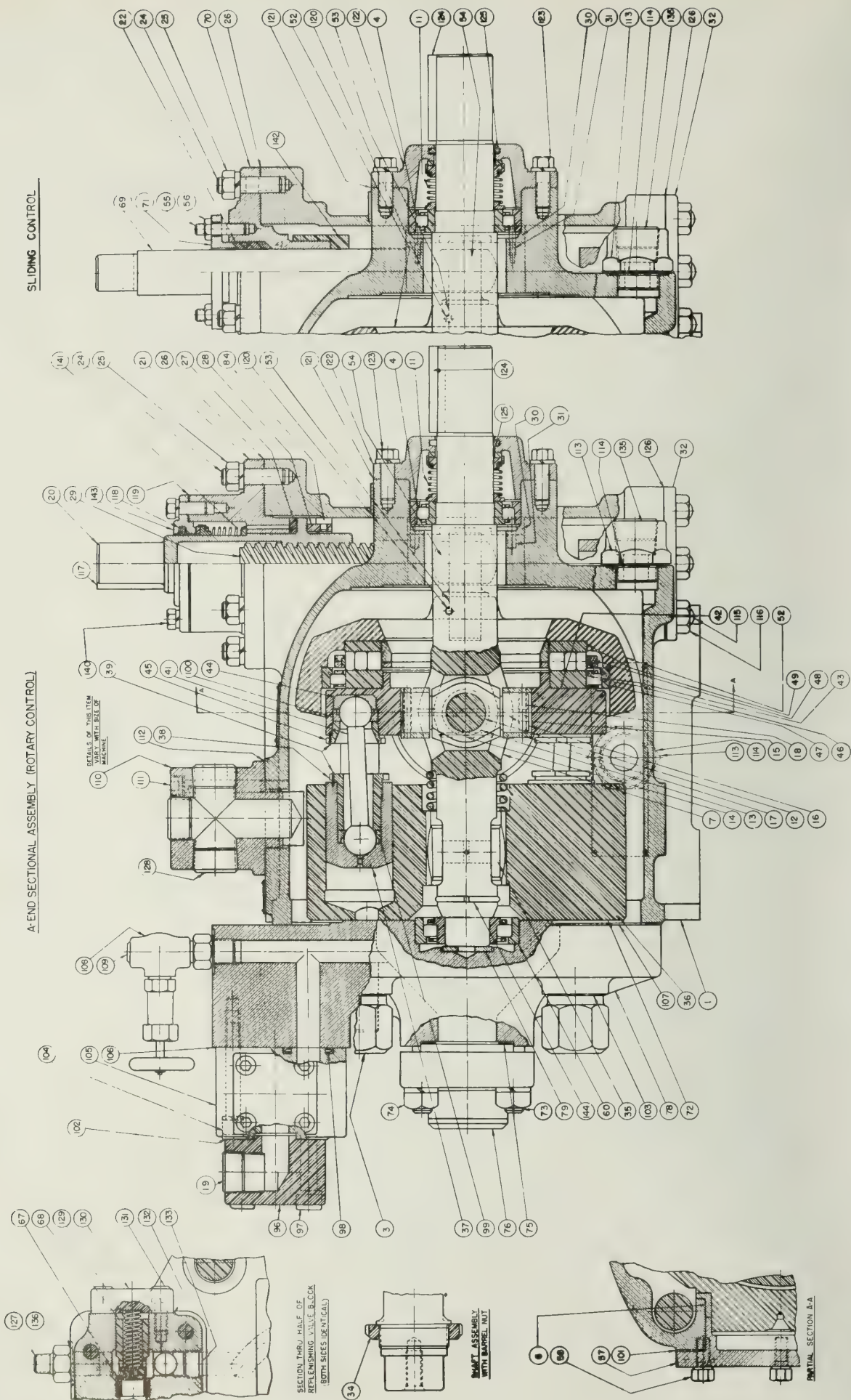


Figure 1.

# PARTS LIST

(References are to numbers appearing in Fig. 1)

1. A-CASE	47. RADIAL RACE	109. PIPE PLUG
2. B-CASE	48. THRUST ROLLER GROUP	110. OIL SCOOP
3. CASE BOLT AND NUT ASSEMBLY	49. BOX THRUST RACE	111. OIL SCOOP RETAINING SCREW
4. MAINSHAFT BEARING	50. ANGLE BOX	112. OIL SCOOP GASKET
6. CASE TRUNNION BUSHING	51. ANGLE BOX SCREW	113. CASE CONNECTION ADAPTER
7. MAINSHAFT	52. TILTING BOX	114. ADAPTER WASHER
11. MAINSHAFT ROTARY SEAL	53. TILTING BOX STUD	115. HOUSING CAP STUD
12. MAINSHAFT PIN	54. TILTING BOX STUD BUSHING	116. STUD NUT
13. MAINSHAFT PIN BUSHING	55. CONTROL GLAND STUD	117. CONTROL SHAFT KEY
14. MAINSHAFT PIN BUSHING PIN	56. CONTROL GLAND STUD NUT	118. CONTROL SHAFT DUST SEAL
15. MAINSHAFT PIN RETAINER	57. TRUNNION COVER	119. BEARING CAP GASKET
16. SHAFT TRUNNIONED BLOCK	58. TRUNNION COVER SCREW	120. TILTING BOX STUD PIN
17. TRUNNION BEARING BLOCK	60. VALVEPLATE BEARING	121. BEARING CAP GASKET
18. BEARING BLOCK SCREW	67. REPLENISHING VALVE SEAT	122. BEARING CAP
19. PIPE PLUG	68. REPLENISHING VALVE PISTON	123. BEARING CAP SCREW
20. CONTROL SHAFT (ROTARY)	69. CONTROL SHAFT (SLIDING)	124. MAINSHAFT KEY
21. CONTROL SHAFT BEARING (ROTARY)	70. CONTROL SHAFT BEARING (SLIDING)	125. MAINSHAFT DUST SEAL
22. CONTROL SHAFT PACKING	71. CONTROL SHAFT PACKING GLAND (SLIDING)	126. HOUSING CAP GASKET
24. CONTROL BEARING STUD	72. CYLINDER BARREL	127. NEEDLE VALVE ADAPTER
25. CONTROL BEARING STUD NUT	73. PIPE FLANGE STUD	128. PIPE PLUG
26. CONTROL BEARING GASKET	74. PIPE FLANGE STUD NUT	129. REPLENISHING VALVE SPRING
27. CONTROL THRUST RING	75. PIPE FLANGE GASKET	130. REPLENISHING VALVE CAP
28. CONTROL SHAFT HANGER	76. PIPE FLANGE	131. REPLENISHING VALVE CAP SCREW
29. CONTROL SCREW	78. VALVEPLATE	132. REPLENISHING VALVE CAP GASKET
30. CONTROL GUIDE KEY	79. INTERSHAFT DISC	133. VALVE BLOCK HOLE PLUG
31. CONTROL GUIDE KEY PIN	84. CONTROL SHAFT HANGER KEY	134. WASHER
32. CONTROL HOUSING CAP	96. VALVE BLOCK FLANGE	135. PIPE PLUG
34. BARREL NUT	97. FLANGE RETAINING SCREW	136. WASHER
35. BARREL KEY	98. VALVE BLOCK SEAL	137. WASHER
36. BARREL SPRING	99. PISTON SOCKET CAP	138. PLUG
37. PISTON	100. RING SOCKET CAP	139. ANGLE BOX DOWEL
38. PISTON CAP NUT	101. TRUNNION COVER GASKET	140. CONTROL BEARING CAP SCREW
39. CAP NUT LOCK	102. VALVE BLOCK FLANGE GASKET	141. CONTROL SHAFT ROTARY SEAL
41. CONNECTING ROD	103. CASE BOLT WASHER	142. CONTROL SHAFT STOP (FOR SLIDING CONTROL)
42. SOCKET RING	104. VALVE BLOCK RETAINING SCREW	143. CONTROL BEARING CAP
43. SOCKET THRUST RACE	105. REPLENISHING VALVE BLOCK	144. BARREL LOCK RING
44. RING SOCKET	106. VALVE BLOCK GASKET	
45. RING SOCKET CAP NUT	107. CASE GASKET	
46. RADIAL ROLLER GROUP	108. NEEDLE VALVE	

# MANUFACTURERS' RECOMMENDATIONS

	SP. Grav.	Cold Test	Flash Point	Fire Point	Viscosity S.S.U. — F°			
					100	130	140	210
Atlantic Refining Co. Turbine Oil — Heavy. . . . .	.879	10°	425	485	290		120	53
Cities Service Refining Co. North Star No. 5. . . . .	.930	0°	340	390	300	138		48
Gulf Refining Co. Gulf Crest C . . . . .	.879	10°	420	480	300	140		52
E. F. Houghton & Co. Cosmolubric Med. Heavy Refrig.	.912	—30°	380	440	310		116	50
Sinclair Refining Co. Rubilene <del>Med.</del> Light Med. . . . .	<del>.905</del> .903	<del>10°</del> 10°	<del>415</del> 415	<del>480</del> 480	<del>310</del> 310	<del>147</del> 147		<del>52</del> 52
Socony-Vacuum Corp. Gargoyle D.T.E. Heavy Med. . . . .	.905	10°	390	445	320	143	118	50
Standard Oil Co., Indiana . . . . . Stanolind Turbine Oil, Heavy . . . . .	.900	40°	410	465	350	165	136	56
Standard Oil Co., N. J., Pa., La. & Colonial Beacon — Teresso 52 . . . . .	.884	25°	440	490	320	150	125	52
Texas Company Regal Oil C . . . . .	.922	0°	375	430	317	138		47
Tide Water Oil Co. Tycol Heavy Medium . . . . .	.896	10°	430	490	300		118	52







# **HYDE**

## **STEAM AND ELECTRIC**

### **WINDLASSES**



**HYDE WINDLASS COMPANY**  
**BATH, MAINE**

**No. 24**



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## ***Description***

### **HYDE STEAM SPUR GEARED WINDLASS**

**T**HE steam windlasses for handling anchor chains today are usually of the spur geared type, similar to illustration on opposite page.

Each of the two wildcats for handling chain has a positive locking device, also friction brake band operated by means of hand wheel.

The gypsies on each side are for handling lines and used generally for warping vessels at the dock.

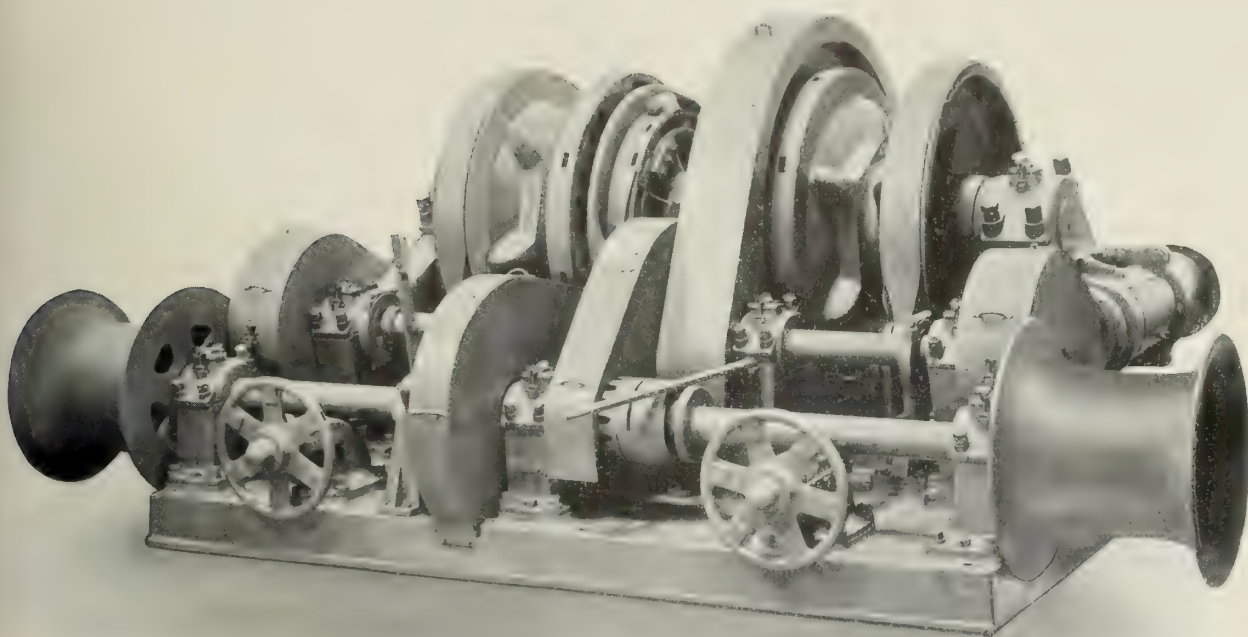
The gears and pinions are steel castings, the teeth of which are accurately machined. Guards are fitted over gearing.

The windlass is driven by reversible, double, horizontal engines self-contained on bedplate with windlass.

Windlasses are designed according to weight of anchor and chains and when sending out inquiries for prices, the size of anchor chain and weight of anchor should be specified.

Windlasses are capable of hoisting simultaneously both anchors and chain from a depth of 30 fathoms at an average speed of 25 to 30 feet per minute.

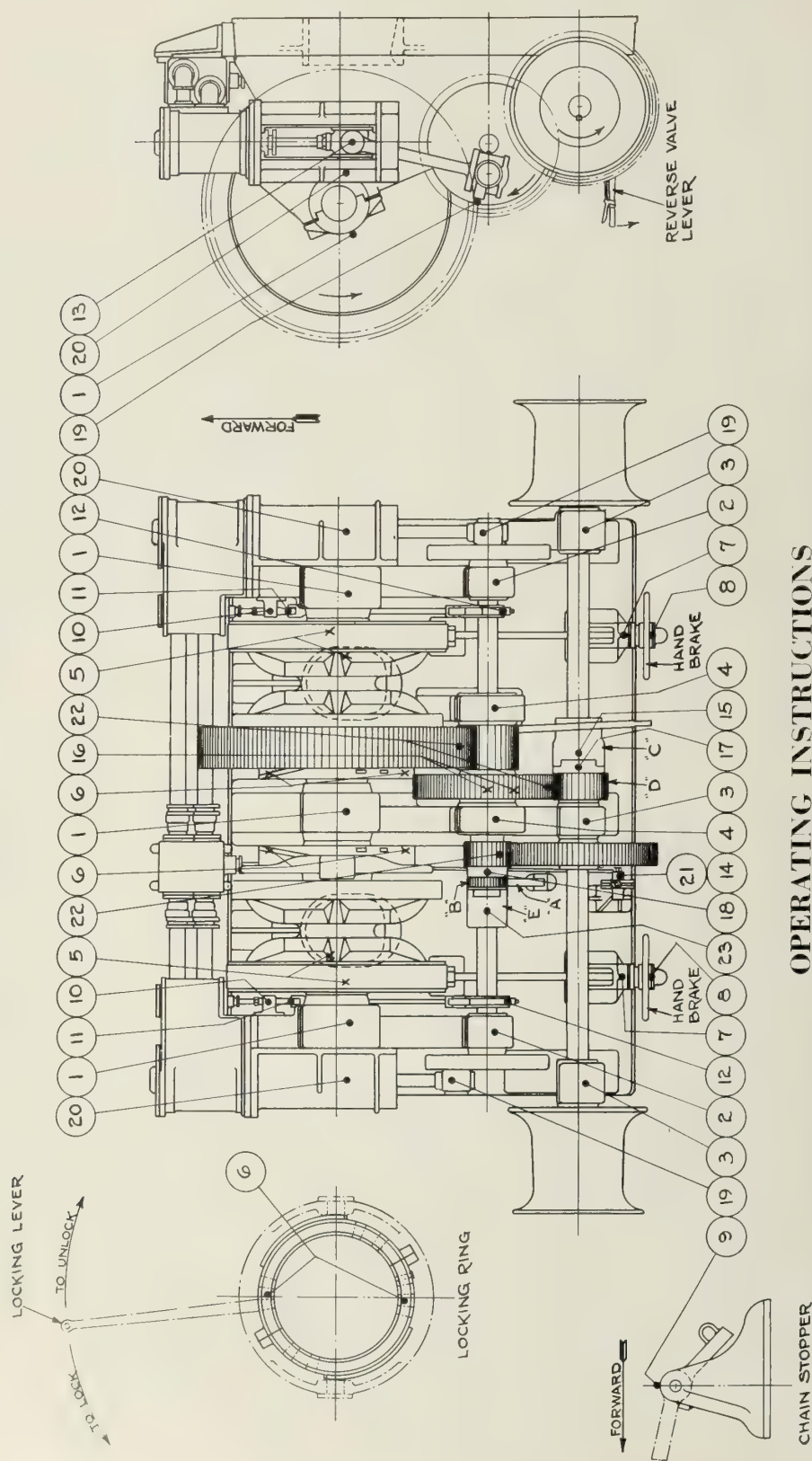
On pages 4 and 5 are given the instructions for operating and lubricating the windlass, and on pages 6 and 7 are sectional views and list of parts.



### THE HYDE STEAM SPUR GEARED WINDLASS

No.	Size Chain	Size Engine	Weight lbs.	Distance c. to c. chains	Width over gypsys	Length Fore and Aft
1	1"	1 $\frac{1}{2}$ x 6	3,250	17 $\frac{1}{2}$ "	6'-0"	4' - 4 $\frac{1}{4}$ "
2	1 $\frac{1}{8}$ "	1 $\frac{1}{2}$ x 6	3,500	17 $\frac{1}{2}$ "	6'-0"	4'-1 $\frac{1}{4}$ "
3	1 $\frac{1}{4}$ "	6 x 8	6,000	20 $\frac{1}{2}$ "	7'-5"	5'-1"
4	1 $\frac{3}{8}$ "	6 x 8	7,000	20 $\frac{1}{2}$ "	7'-5"	5'-1"
5	1 $\frac{1}{2}$ "	7 x 8	10,200	34"	9'-1"	6'-6"
6	1 $\frac{5}{8}$ "	7 x 8	11,000	34"	9'-1"	6'-6"
7	1 $\frac{3}{4}$ "	8 x 8	15,000	35 $\frac{1}{4}$ "	11'-0"	7'-0"
8	1 $\frac{7}{8}$ "	8 x 10	18,000	38 $\frac{1}{4}$ "	11'-3"	7'-3"
9	2"	9 x 10	24,000	17"	12'-3"	8'-7"
10	2 $\frac{1}{8}$ "	9 x 10	26,000	18"	12'-11 $\frac{1}{2}$ "	8'-7"
11	2 $\frac{1}{4}$ "	10 x 10	29,800	18 $\frac{3}{4}$ "	12'-11 $\frac{1}{2}$ "	8'-7"
11	2 $\frac{3}{8}$ "	10 x 11	34,000	50 $\frac{1}{4}$ "	12'-11 $\frac{1}{2}$ "	9'-5"
12	2 $\frac{1}{2}$ "	11 x 14	12,000	56"	11'-1"	9'-6"
13	3"	12 x 14	51,000	59 $\frac{3}{4}$ "	15'-1"	10'-4"

# HYDE STEAM SPUR GEARED WINDLASS



## OPERATING INSTRUCTIONS

The windlass is operative in either direction by use of a reverse valve actuated by a hand lever located on after side of windlass.

The engines are designed for a steam pressure of 125 lbs. if the steam supply is at a greater pressure, a reducing valve should be provided in the steam line.

Before operating windlass under load it is recommended that the engines be turned over for a short time with cylinder drain cocks open to free the system of water. Then close drain cocks and operate as needed.

Locking blocks are engaged with and disengaged from the wildcat by operator inserting a lever in the locking ring and moving top of ring aft to unlock and forward to lock. Always move locking ring the full extent of travel to insure proper alignment of the locking blocks.

Pawl "A" is provided to engage with pinion "B" on crank shaft for the purpose of holding heavy loads. Under ordinary operating conditions this pawl should be disengaged.



To lower an anchor, first see that the hand brake is set on the wildcat of the anchor selected to be lowered, lift chain stopper pawl clear of chain, unlock wildcat and release hand brake. It is recommended that when lowering the anchor it be kept under control by the hand brake. After chain is veered to the desired length, the chain stopper pawl is dropped in place for "riding by," and to relieve strain on windlass. An anchor may be lowered with use of engines if desired.

To hoist an anchor see that the locking blocks engage

wildcat. Release hand brake and start engines by opening throttle valve in steam line and moving reverse valve lever aft in direction of arrow. After anchor is housed, set hand brake and unlock wildcat.

If it is desired to use the warping heads and not the wildcats, disengage clutch "C" from pinion "D". The warping heads may now be operated in either direction.

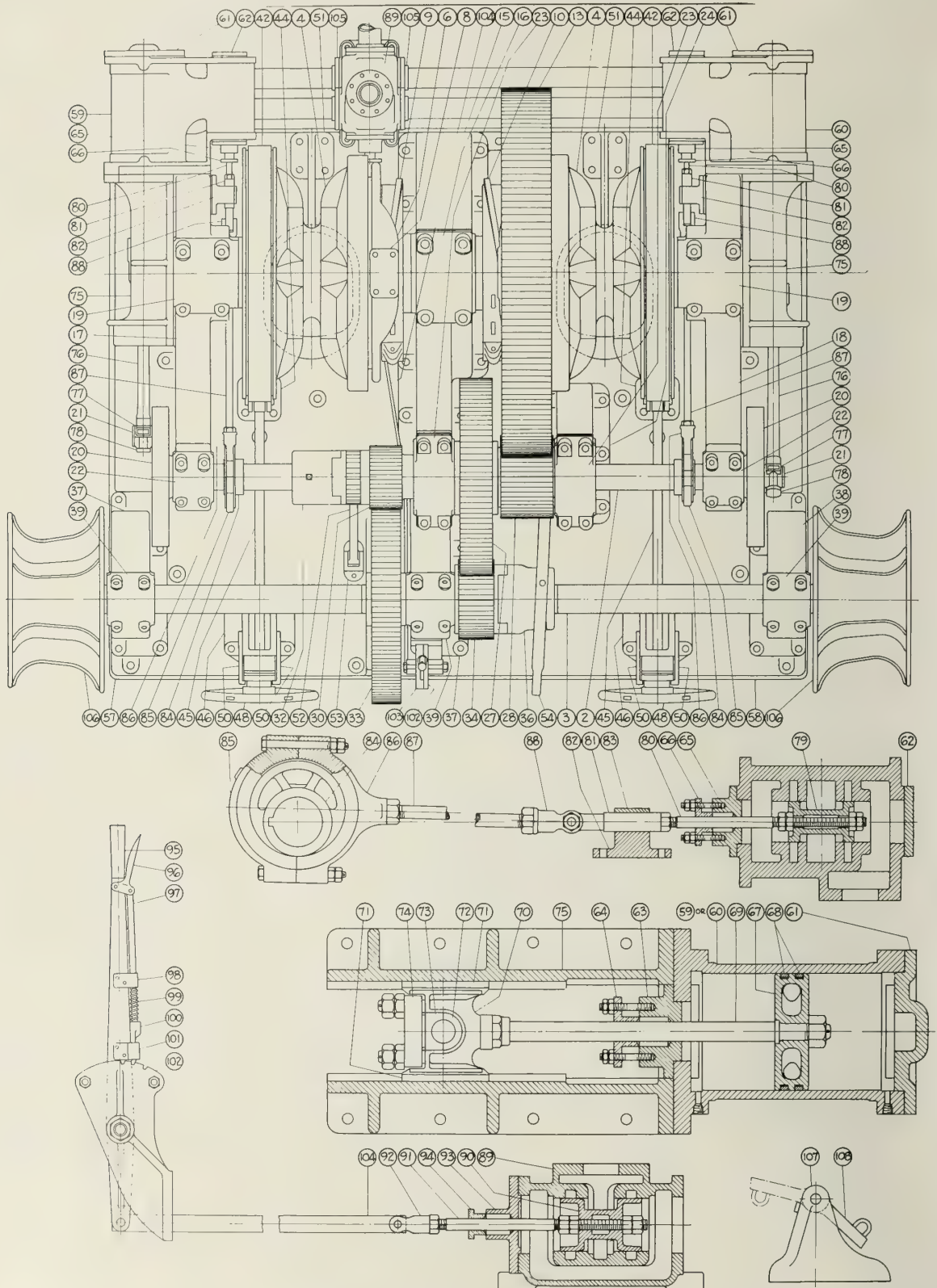
Should it be necessary to idle engines, clutch "E" on crank shaft must be disengaged from pinion "B".

LUBRICATION INSTRUCTIONS

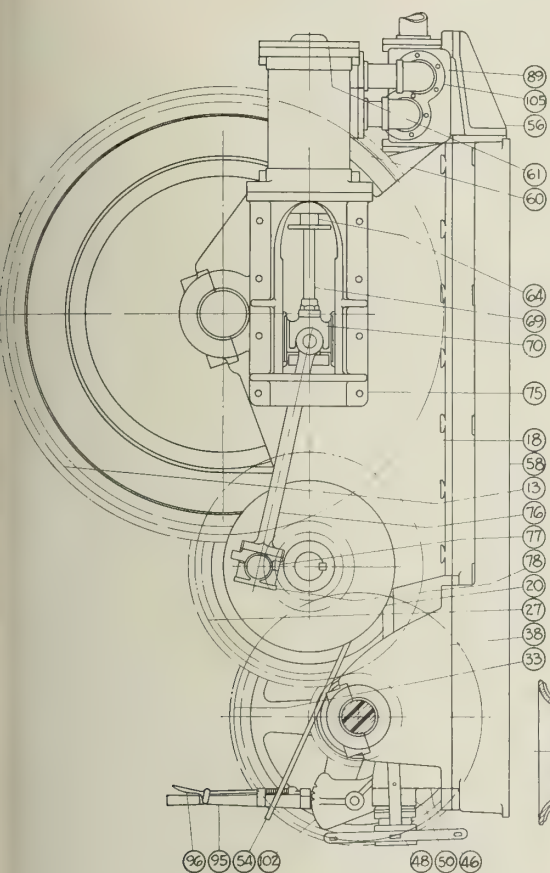
Symbol ● indicates that place of application may be seen in view so marked.  
Symbol X indicates that place of application is not in sight in view so marked but accessible under X.

Mark	Part Lubricated	No. of Places	Method	Lubricant	Spec's	Application		
1	Windlass Shaft Bearings	3	Pressure	Grease	Medium Grade	Daily when operating		
2	Crank Shaft Bearings	2						
3	Head Shaft Bearings	3						
4	Main Pinion Sleeve Bearings	2						
5	Wildcat Bushings	4						
6	Locking Rings	4						
7	Friction Steps	2						
8	Friction Brake Handwheels	2						
9	Chain Stopper Pawls	2						
10	Valve Stem Guides	2						
11	Eccentric Rod Knuckles	2						
12	Eccentric Straps	2						
13	Wrist Pins	2						
14	Reverse Valve Lever Bearing	1	Oil Can	Oil	S.A.E. 20			
15	Head Shaft Clutch	1						
16	Main Pinion Bushings	2						
17	Intermediate Pinion Bushing	1						
18	Drive Pinion Bushing	1						
19	Crank Pins	2						
20	Crosshead Slides	2						
21	Reverse Valve Link Pins	2						
22	Spur Gears	3				Brush Pressure	Grease	Gear Grease Medium Grade
23	Crank Shaft Clutch	1						

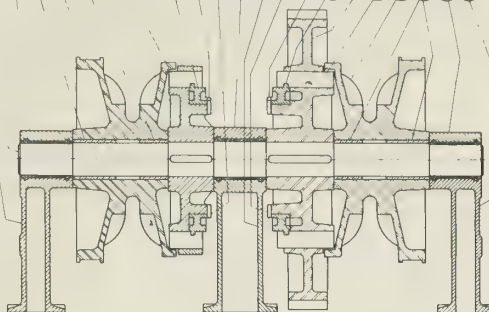
# HYDE STEAM WINDLASS — LIST OF PARTS



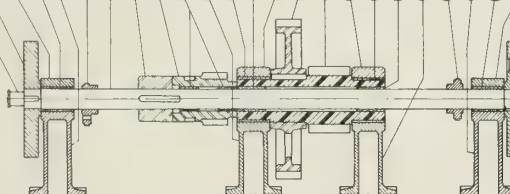
# HYDE STEAM WINDLASS — LIST OF PARTS



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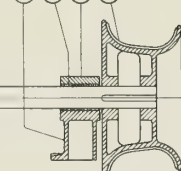
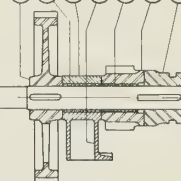
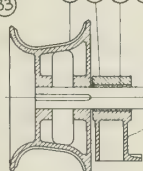
21 20 22 25 17 84 2 32 30 31 15 26 29 23 27 28 25 26 29 24 84 18 25 22 20 21



106 39 40 37 3

33 41 39 37 35 34 36

38 40 39 106

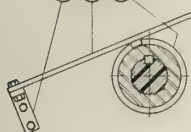


36 95 54 102

48 50 46

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30 52 53



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- 1 WINDLASS SHAFT
- 2 CRANK SHAFT
- 3 HEAD SHAFT
- 4 WILDCAT
- 5 WILDCAT BUSHINGS
- 6 LOCKING BAND
- 7 LOCKING BLOCK (PORT)
- 8 LOCKING BLOCK CAP
- 9 HALF LOCKING RING (PORT)
- 10 HALF LOCKING RING (STBD)
- 11 CLIP WITH STOP
- 12 CLIP WITHOUT STOP
- 13 MAIN SPUR GEAR & BAND
- 14 LOCKING BLOCK (STBD)
- 15 CENTER BITT
- 16 CENTER BITT CAP
- 17 SIDE BITT (PORT)
- 18 SIDE BITT (STBD)
- 19 SIDE BITT CAP
- 20 CRANK DISK
- 21 CRANK PIN
- 22 CRANK SHAFT BEARING CAP
- 23 MAIN PINION BEARING CAP
- 24 MAIN PINION BEARING
- 25 CRANK SHAFT BEARING BOX
- 26 MAIN PINION BEARING BOX
- 27 SPUR GEAR (MAIN PINION SLEEVE)
- 28 MAIN SPUR PINION
- 29 MAIN SPUR PINION BUSHINGS
- 30 SPUR PINION (CRANK SHAFT)
- 31 PINION BUSHINGS (CRANK SHAFT)
- 32 CLUTCH (CRANK SHAFT)
- 33 SPUR GEAR (HEAD SHAFT)
- 34 SPUR PINION (HEAD SHAFT)
- 35 PINION BUSHING (HEAD SHAFT)
- 36 CLUTCH (HEAD SHAFT)

## LIST OF PARTS

- 37 HEAD SHAFT BEARING
- 38 HEAD SHAFT BEARING CAP
- 39 HEAD SHAFT BEARING CAP
- 40 HEAD SHAFT BEARING BOX
- 41 HEAD SHAFT BEARING BOX
- 42 FRICTION BAND
- 43 FRICTION LINK
- 44 FRICTION EYE
- 45 FORKED CONNECTION
- 46 FRICTION STEP
- 47 FRICTION BALL
- 48 FRICTION HANDWHEEL
- 49 FRICTION HANDWHEEL BUSHING
- 50 FRICTION HANDWHEEL HOLDER
- 51 CHAIN CLEARER
- 52 RATCHET PAWL
- 53 RATCHET PAWL STAND
- 54 CLUTCH LEVER
- 55 CLUTCH LEVER SUPPORT
- 56 REVERSE VALVE SUPPORT
- 57 BED PLATE, PORT HALF
- 58 BED PLATE, STBD HALF
- 59 CYLINDER (PORT)
- 60 CYLINDER (STBD)
- 61 CYLINDER HEAD
- 62 STEAM CHEST COVER
- 63 PISTON ROD STUFFING BOX
- 64 PISTON ROD STUFFING BOX GLAND
- 65 VALVE STEM STUFFING BOX
- 66 VALVE STEM STUFFING BOX GLAND
- 67 PISTON
- 68 PISTON RING
- 69 PISTON ROD
- 70 CROSSHEAD
- 71 CROSSHEAD GIB
- 72 CROSSHEAD BOX
- 73 CROSSHEAD BOX
- 74 CROSSHEAD BINDER
- 75 ENGINE SLIDES
- 76 CONNECTING ROD
- 77 CONNECTING ROD BOX
- 78 CONNECTING ROD BOX
- 79 PISTON VALVE
- 80 VALVE STEM
- 81 VALVE STEM GUIDE BLOCK
- 82 VALVE STEM GUIDE
- 83 VALVE STEM GUIDE CAP
- 84 ECCENTRIC SHAFT
- 85 ECCENTRIC STRAP
- 86 ECCENTRIC STRAP
- 87 ECCENTRIC ROD
- 88 ECCENTRIC ROD KNUCKLE
- 89 REVERSE VALVE BODY
- 90 REVERSE VALVE PISTON VALVE
- 91 REVERSE VALVE STEM
- 92 REVERSE VALVE STEM KNUCKLE
- 93 REVERSE VALVE STUFFING BOX
- 94 REVERSE VALVE STUFFING BOX GLAND
- 95 CONTROL LEVER
- 96 CONTROL LEVER GRIP
- 97 CONTROL LEVER LATCH ROD
- 98 CONTROL LEVER LATCH ROD GUIDE
- 99 CONTROL LEVER LATCH SPRING
- 100 CONTROL LEVER LATCH
- 101 CONTROL LEVER LATCH GUIDE
- 102 CONTROL LEVER BEARING & QUADRANT
- 103 CONTROL LEVER QUADRANT
- 104 CONTROL LEVER LINK
- 105 PIPE FITTING ON REVERSE VALVE
- 106 WINDLASS HEAD
- 107 CHAIN STOPPER BODY
- 108 CHAIN STOPPER PAWL



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## ***Description***

### **HYDE ELECTRIC SPUR GEARED WINDLASS**

**T**HE electrically driven auxiliaries for use on shipboard are used quite extensively today. The windlass illustrated on opposite page is of the electric spur geared type.

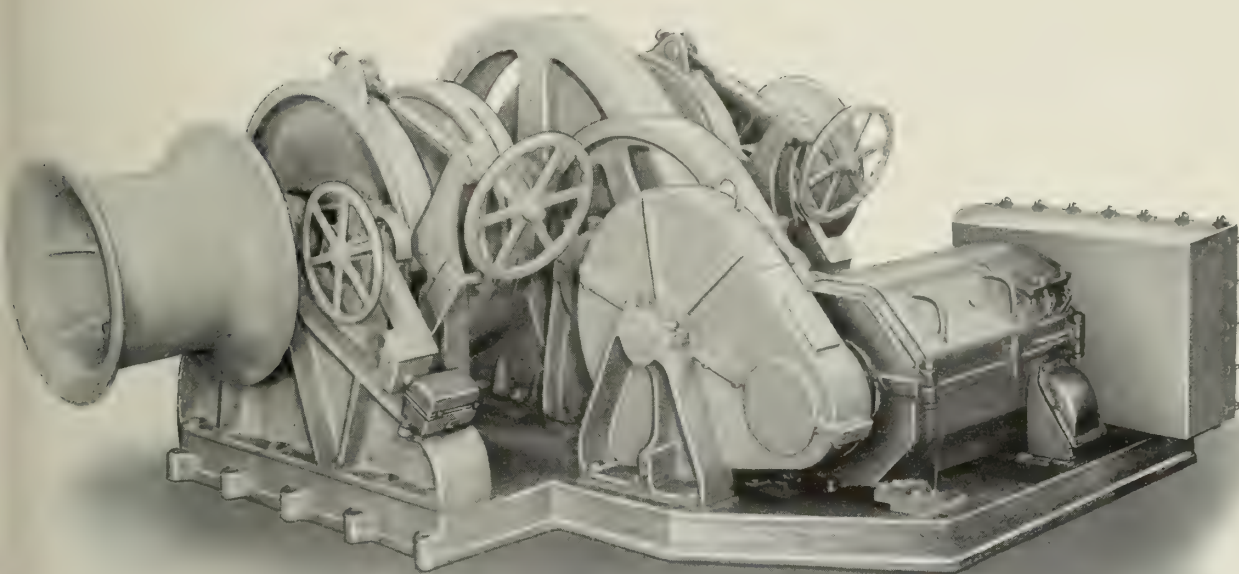
The windlass is very similar in design to the steam windlass shown on page 2 and has two wildcats: each wildcat fitted with independent locking device and brake band operated by hand wheel.

Two gypsies are fitted on ends of windlass shaft for handling lines used generally for warping ship at the dock.

The motor for driving the windlass is located just aft of the windlass self-contained on same bedplate. Motor is fitted with a magnetic shoe type brake. Both motor and brake are made water-tight for locating on deck exposed to the weather.

When writing for prices, weight of anchor should be specified as well as size of chain and also advise whether AC or DC current and the voltage. This information is necessary in order to determine size of windlass and correct horse power of motor.

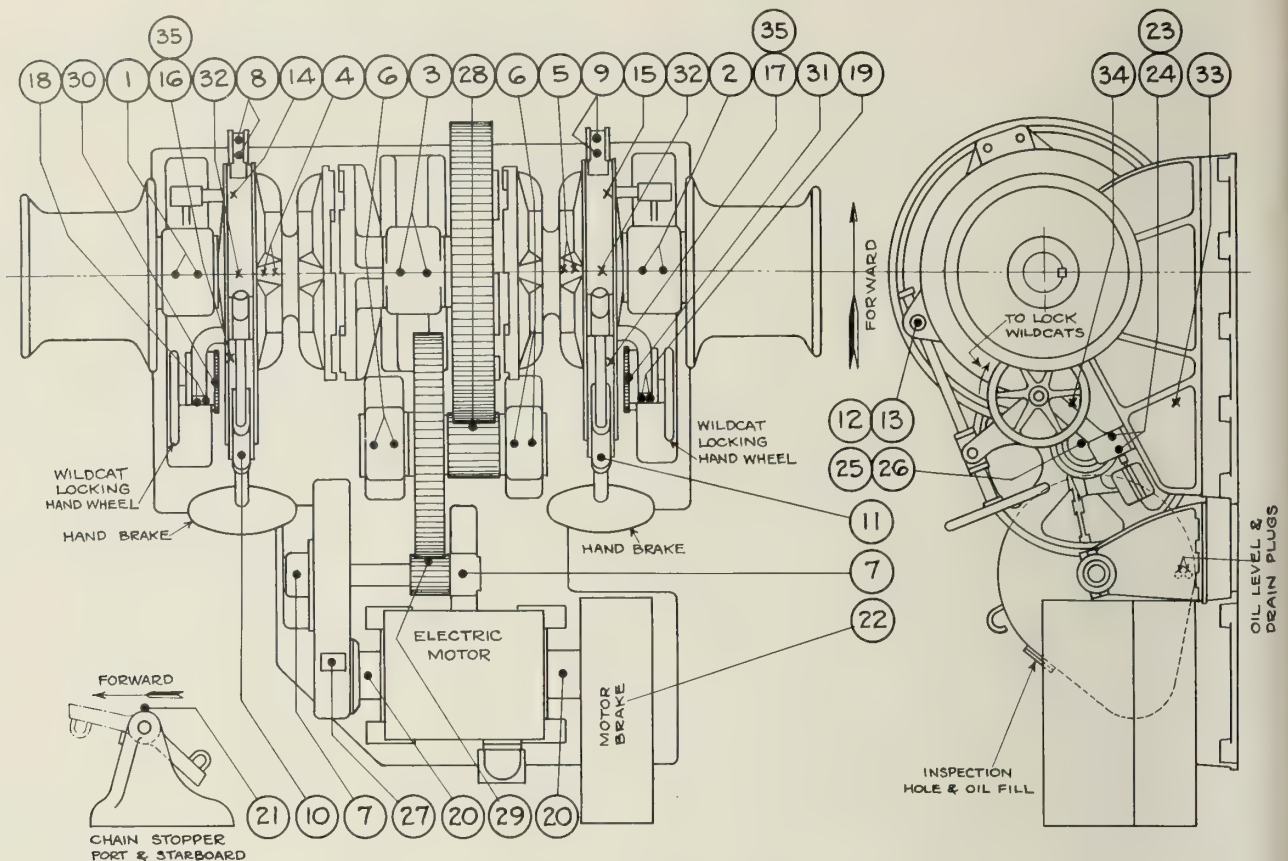
On pages 10 and 11 are given instructions for operating and lubricating the windlass and on page 12 is a sectional view and on page 13 a list of parts.



### HYDE ELECTRIC SPUR GEARED WINDLASS

No.	Size Chain	H.P. Motor	Weight Lbs.	Distance c. to c. Chains	Width over Gypsies	Length Fore and Aft
3	1 1/4"	15	6600	2' - 11 1/2"	7' - 3"	7' - 6"
4	1 3/8"	20	7000	2' - 11 1/2"	7' - 3"	7' - 6"
5	1 1/2"	25	10700	2' - 8"	7' - 10"	7' - 11"
6	1 5/8"	30	13000	2' - 8"	7' - 10"	7' - 11"
7	1 3/4"	35	15500	3' - 3"	9' - 8"	8' - 11"
8	1 7/8"	35	16000	3' - 3"	9' - 8"	8' - 11"
9						
10						
11	2 1/4"	60	26500	1' - 0"	12' - 2"	11' - 0"
12	2 1/2"	75	38000	1' - 8"	13' - 4"	11' - 4"
13	2 3/4"	75	48000	1' - 11 3/4"	14' - 0"	11' - 10 1/2"

## HYDE ELECTRIC SPUR GEARED WINDLASS



### OPERATING INSTRUCTIONS

For the windlass to be operative, the normal power supply must be available at the controller terminals and unblown fuses in place.

The wildcats are engaged with or disengaged from the locking heads by use of handwheels located on either side of the machine. To lock a wildcat, move top of handwheel forward until grabs on wildcat are fully engaged with those on locking head. To unlock, reverse operation.

To lower an anchor by power, see that the wildcat of the anchor selected to be lowered is engaged with locking head. Lift chain stopper pawl clear of chain, release hand brake and move electric control lever to "lower" position. Faster lowering may be obtained by moving control lever to second or third position. Moving control lever to "off" position stops motor and sets magnetic brake. After chain is veered to desired

length, the chain stopper pawl is dropped in place for "riding by" and to relieve strain on windlass.

An anchor may be lowered free by having the wildcat disengaged and releasing the hand brake. Set brake again when the desired amount of chain is out. It is recommended that when anchor is lowered free, it be kept under control by hand brake.

To hoist the anchor, see that wildcat is engaged with locking head, release hand brake and move electric control lever to the "hoist" position of the speed desired. After anchor is housed, set hand brake and unlock wildcat.

If it is desired to use the warping heads and not the wildcats, set hand brakes sufficiently to hold wildcats stationary, then unlock wildcats. The warping heads may now be operated in either direction by electric motor.



# OPERATING INSTRUCTIONS (Continued)

## LUBRICATION INSTRUCTIONS

Symbol ● indicates that place of application may be seen in view so marked.

Symbol X indicates that place of application is not in sight in view so marked but accessible under X.

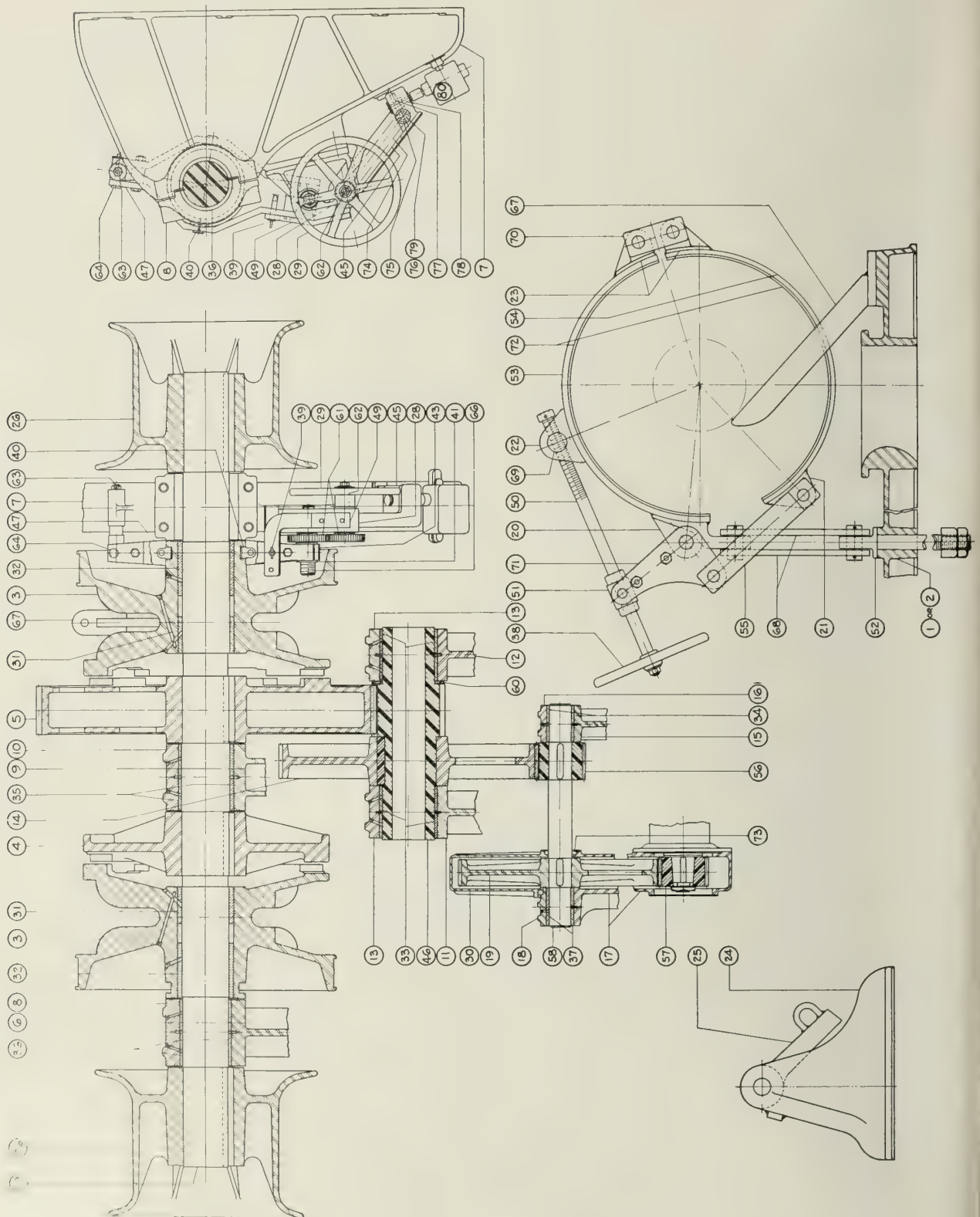
Mark	Part Lubricated	No. of Places	Method	Lubricant	Spec's	Application
1	Side Bitt, Port	2	Pressure	Grease	Medium Grade	Daily when operating
2	Side Bitt, St'b'd	2	"	"	"	" " "
3	Center Bitt	2	"	"	"	" " "
4	Wildcat Bushings, Port	2	"	"	"	" " "
5	Wildcat Bushings, St'b'd	2	"	"	"	" " "
6	Intermediate Shaft Bearings	4	"	"	"	" " "
7	Counter Shaft Bearings	2	"	"	"	" " "
8	Brake Band Hinge Lug, Port	2	"	"	"	" " "
9	Brake Band Hinge Lug, St'b'd	2	"	"	"	" " "
10	Bell Crank Trunnion, Port	1	"	"	"	" " "
11	Bell Crank Trunnion, St'b'd	1	"	"	"	" " "
12	Brake Rod Nut, Port	1	"	"	"	" " "
13	Brake Rod Nut, St'b'd	1	"	"	"	" " "
14	Locking Lever Fulcrum, Port	1	"	"	"	" " "
15	Locking Lever Fulcrum, St'b'd	1	"	"	"	" " "
16	Floating Nut, Port	1	"	"	"	" " "
17	Floating Nut, St'b'd	1	"	"	"	" " "
18	Locking Screw Bearing, Port	2	"	"	"	" " "
19	Locking Screw Bearing, St'b'd	2	"	"	"	" " "
20	Motor	2	"	"	"	Quarterly
21	Chain Stopper Pawl, Port & St'b'd	2	"	"	"	Daily when operating
22	Motor Brake Parts	6*	Oil Can	Oil	SAE 20	" " "
23	Worm Gear Bearings, Port	2	" "	"	"	" " "
24	Worm Gear Bearings, St'b'd	2	" "	"	"	" " "
25	Chain Sprocket Case, Port	1	" "	"	"	" " "
26	Chain Sprocket Case, St'b'd	1	" "	"	"	" " "
27	Motor Spur Gear Case	1	"	"	SAE 40	Keep to oil level indicated Change twice a year
28	Main Gears	1	Brush	Grease	Gear Grease	Daily when operating
29	Intermediate Gears	1	"	"	"	" " "
30	Locking Screw Gears, Port	1	"	"	"	" " "
31	Locking Screw Gears, St'b'd	1	"	"	"	" " "
32	Locking Yokes, Port & St'b'd	2	Pressure	"	Medium Grade	" " "
33	Brake Anchor Bolt Pins, Port & St'b'd.	2	"	"	"	" " "
34	Brake Band Anchor Lugs, Port & St'b'd.	2	"	"	"	" " "
35	Locking Lever Gibs, Port & St'b'd.	2	"	"	"	" " "

\* Approximately.

### GENERAL NOTE:

Frequency of application should be governed by the operating hours of machine together with the temperature under which machine is operated.

# HYDE ELECTRIC SPUR GEARED WINDLASS

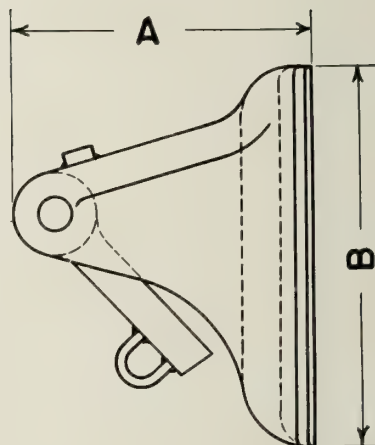
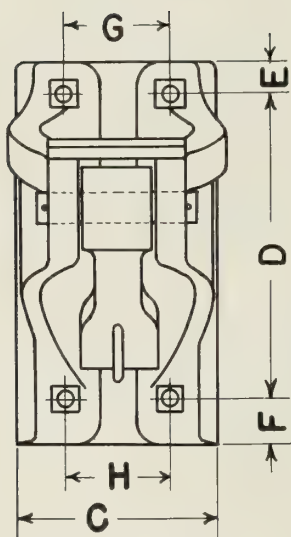


# LIST OF PARTS

1. BED PLATE, PORT HALF
2. BED PLATE, STARBOARD HALF
3. WILDCAT
4. DRIVING HEAD
5. MAIN SPUR GEAR
6. SIDE BITT, PORT
7. SIDE BITT, STARBOARD
8. SIDE BITT BEARING CAP
9. CENTER BITT
10. CENTER BITT BEARING CAP
11. INTERMEDIATE SHAFT BEARING, PORT
12. INTERMEDIATE SHAFT BEARING, STARBOARD
13. INTERMEDIATE SHAFT BEARING CAP
14. INTERMEDIATE SPUR GEAR
15. COUNTER SHAFT BEARING
16. COUNTER SHAFT BEARING CAP
17. MOTOR SPUR GEAR CASING
18. GEAR CASING BEARING CAP
19. MOTOR SPUR GEAR
20. BRAKE BAND ANCHOR LUG
21. BELL CRANK LINK LUG
22. BRAKE SCREW NUT LUG
23. BRAKE BAND HINGE LUG
24. CHAIN STOPPER BODY
25. CHAIN STOPPER PAWL
26. WINDLASS HEAD
27. LOCKING SCREW BEARING, PORT
28. LOCKING SCREW BEARING, STARBOARD
29. LOCKING HANDWHEEL
30. SPUR GEAR CASING COVER
31. WILDCAT BUSHING
32. WILDCAT BUSHING
33. INTERMEDIATE SHAFT BEARING BOX
34. COUNTER SHAFT BEARING BOX
35. CENTER BITT BEARING BOX
36. SIDE BITT BEARING BOX
37. GEAR CASING BEARING BOX
38. BRAKE HANDWHEEL
39. LOCKING PIN
40. YOKE
41. FLOATING NUT GIB
42. FLOATING NUT, PORT
43. FLOATING NUT, STARBOARD
44. CHAIN AND SPROCKET CASE, PORT
45. CHAIN AND SPROCKET CASE, STARBOARD
46. MAIN SPUR PINION
47. LOCKING LEVER
48. LOCKING LEVER QUADRANT, PORT
49. LOCKING LEVER QUADRANT, STARBOARD
50. BRAKE SCREW
51. BELL CRANK TRUNNION
52. BRAKE BAND ANCHOR BOLT
53. BRAKE BAND, UPPER HALF
54. BRAKE BAND, LOWER HALF
55. BELL CRANK LINK
56. INTERMEDIATE SPUR PINION
57. MOTOR SPUR PINION
58. COUNTER SHAFT
59. WINDLASS SHAFT
60. MAIN SPUR PINION COLLAR
61. LOCKING SPUR GEAR
62. LOCKING HANDWHEEL SHAFT
63. LOCKING LEVER FULCRUM
64. LOCKING LEVER FULCRUM PIN
65. LOCKING SCREW, PORT
66. LOCKING SCREW, STARBOARD
67. CHAIN CLEARER
68. BRAKE BAND ANCHOR LINK
69. BRAKE SCREW NUT
70. BRAKE BAND HINGE LINK
71. BELL CRANK
72. BRAKE BAND LINING
73. OIL SEAL RING
74. SPROCKET CHAIN
75. CHAIN SPROCKET
76. WORM
77. WORM GEAR
78. WORM GEAR SHAFT
79. WORM AND SPROCKET SHAFT
80. DUAL CONTROL LIMIT SWITCH



## HYDE COMMON CHAIN STOPPERS



Size of Chain	1/2	5/8	3/4	1	1 1/8	1 1/4	1 3/8	1 1/2	1 5/8	1 3/4	1 7/8	2	2 1/8	2 1/4	2 1/2	2 3/4
Size of Bolts	1/2	1/2	5/8	3/4	7/8	7/8	1	1	1 1/8	1 1/8	1 1/4	1 1/4	1 1/4	1 1/4	1 3/8	1 3/4
A	5 3/4	7 1/4	8 1/4	9 3/4	12 5/8	12 5/8	16 1/8	16 1/8	17 1/4	19	20 7/8	20 7/8	23 3/4	25	27	29 1/4
B	8	9	10 7/8	13 1/2	16 1/2	16 1/2	19 1/2	19 1/2	22	24 1/2	25	25	30	31 1/2	36	44
C	1 1/2	5	6 1/4	7	9	9	11	11	12 1/2	13 1/2	14	14	15	16 3/4	18	19
D	5 5/8	6 1/4	8 3/8	10 1/8	12 3/4	12 3/4	16	16	18	20 1/2	20 1/2	20 1/2	25	25 1/8	29 3/4	37 1/2
E	3	1 1/4	1	1 1/8	1 3/8	1 3/8	1 1/2	1 1/2	2	2	2	2	2 1/2	2 5/8	2 1/4	3
F	1 1/2	1 1/2	1 1/2	2 1/4	2 3/8	2 3/8	2	2	2	2	2 1/2	2 1/2	2 1/2	3 3/4	4	3 1/2
G	1 3/4	2 3/8	2 3/4	2 3/4	3 5/8	3 5/8	5 1/2	5 1/2	5 1/2	6 1/2	7	7	7 1/2	9	11	11
H	2 1/2	2 5/8	3 1/4	3 5/8	4 3/4	4 3/4	5 1/2	5 1/2	6	7 1/2	7	7	7 1/2	8 3/4	10	11

# ANCHORS and CHAINS

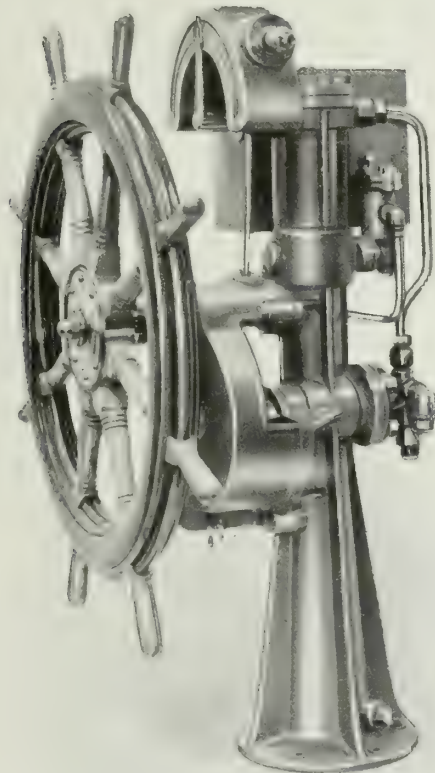
DI-LOC CHAIN					CAST STEEL CHAIN			
Weight Anchor Lbs.	Size Inches	Breaking Strength Lbs.	Proof Strength Lbs.	Weight 15 FTH.	Size Inches	Breaking Strength Lbs.	Proof Strength Lbs.	Weight 15 FTH.
560	$\frac{3}{4}$	75000	48000	190	* $\frac{3}{4}$	33880	22680	480
665	$\frac{13}{16}$				* $\frac{13}{16}$	39872	26600	570
770	$\frac{7}{8}$	98000	64000	680	* $\frac{7}{8}$	46200	30800	655
875	$\frac{15}{16}$				* $\frac{15}{16}$	53088	35392	755
1015	1	129000	84000	890	*1	60480	40320	855
1190	$1\frac{1}{16}$				* $1\frac{1}{16}$	68096	45472	970
1365	$1\frac{1}{8}$	161000	106000	1130	* $1\frac{1}{8}$	76440	50960	1085
1575	$1\frac{3}{16}$				* $1\frac{3}{16}$	85120	56840	1215
1785	$1\frac{1}{4}$	198000	130000	1400	* $1\frac{1}{4}$	94360	63000	1345
2800	$1\frac{5}{16}$				* $1\frac{5}{16}$	104160	69440	1485
3150	$1\frac{3}{8}$	235000	157000	1690	$1\frac{3}{8}$	156330	111660	1625
3815	$1\frac{7}{16}$				$1\frac{7}{16}$	170430	121720	1775
4130	$1\frac{1}{2}$	280000	185000	2010	$1\frac{1}{2}$	185060	132190	1935
4445	$1\frac{9}{16}$				$1\frac{9}{16}$	200270	143050	2090
4725	$1\frac{5}{8}$	325000	216000	2325	$1\frac{5}{8}$	216030	154310	2235
5110	$1\frac{11}{16}$				$1\frac{11}{16}$	232360	165960	2410
5600	$1\frac{3}{4}$	379000	249000	2695	$1\frac{3}{4}$	249210	178000	2590
6580	$1\frac{13}{16}$				$1\frac{13}{16}$	266620	190430	2785
7070	$1\frac{7}{8}$	432000	285000	3095	$1\frac{7}{8}$	284540	203250	2975
7665	$1\frac{15}{16}$				$1\frac{15}{16}$	303000	216430	3175
8225	2	488000	322000	3490	2	322000	230000	3355
8855	$2\frac{1}{16}$				$2\frac{1}{16}$	341510	243930	3570
9415	$2\frac{1}{8}$	548000	362000	3935	$2\frac{1}{8}$	361530	258240	3785
10045	$2\frac{3}{16}$				$2\frac{3}{16}$	382060	272910	4015
10640	$2\frac{1}{4}$	610000	403000	4415	$2\frac{1}{4}$	403100	287930	4245
12005	$2\frac{5}{16}$				$2\frac{5}{16}$	424630	303320	4485
12740	$2\frac{3}{8}$	675000	447000	4915	$2\frac{3}{8}$	446660	319050	4725
13370	$2\frac{7}{16}$				$2\frac{7}{16}$	469180	335130	4960
14105	$2\frac{1}{2}$	744000	492000	5475	$2\frac{1}{2}$	492190	351560	5265
14805	$2\frac{9}{16}$				$2\frac{9}{16}$	515670	368340	5535
15575	$2\frac{5}{8}$	813000	540000	6050	$2\frac{5}{8}$	539620	385440	5815
16345	$2\frac{11}{16}$				$2\frac{11}{16}$	564040	402890	6105
17990	$2\frac{3}{4}$	888000	589000	6660	$2\frac{3}{4}$	588930	420660	6405
18900	$2\frac{13}{16}$				$2\frac{13}{16}$	614260	438760	6705
19810	$2\frac{7}{8}$	965000	640000	7295	$2\frac{7}{8}$	640070	457190	7015
20685	$2\frac{15}{16}$				$2\frac{15}{16}$	666310	475940	7330
21560	3	1045000	693000	7955	3	693000	495000	7650

\* Wrought iron chain.





*The*  
**BROWN TYPE**  
**HYDRAULIC TELEMOTOR**



**HYDE WINDLASS COMPANY**  
**BATH, MAINE**

**No. 25**

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## THE BROWN TYPE TELEMOTOR

THE most recent practice in fitting steam steering gears to steamships, is to place the steering engine directly attached to the rudderhead, thus dispensing with chains or wire ropes leading from the rudderhead to the steering engine amidships, as in the older method. This departure gets rid of the danger connected with the breaking of such chains or ropes, and also the objectionable noise accompanying their working.

With the steering engine close to the rudder, it becomes necessary to have some means of communication between the control valve aft and the steering wheel on the bridge, which latter is situated in many cases very close to the bow of the ship. This is usually carried out by a line of shafting, running in a great number of bearings, and requiring bevel wheels and Hooke's joints when the shafting deviates from the straight line.

In most ships, and particularly in long ships, the friction of this gearing is very considerable, and the steering wheel is consequently very stiff to work. Attention is also required in oiling the various parts, and unless the shafting is very heavy, there is a considerable spring or twist taking place between the wheel on the bridge and the valve gear aft, which tends to irregular steering.

The object of the telemotor is to supply a means of communication as near as possible frictionless, however tortuous the line may be. The method by which this end may be obtained is by a hydraulic device as shown, which is most suitable for the larger class of vessels, where the line of communication has to pass round corners, under decks, etc., for the purpose of avoiding cabins and other important spaces.

In the telemotor, there is an important function performed which, in passing the zero point amidships, causes an automatic adjustment or regulation to take place should the indicator not correspond with the actual position of the rudder.

It is sometimes necessary to set the gear so that this central position does not actually represent the rudder as true fore and aft, but a certain amount of permanent helm is given to counteract the action of the propeller in steering, and this is done by making the connecting links longer or shorter as the case may require.

In some exceptional cases, where it might be inconvenient to adjust the gear by running the indicator into its mid-position by the steering wheel, and so momentarily affecting the straight course of the ship, there is provided a by-pass valve "R" which, when opened, gives a free communication between the upper and lower cylinders, and so allowing the indicator to be brought to zero without moving the rudder aft.

A small tank "O" is provided with a gauge glass at the end. This is usually filled with a mixture of glycerine and water, one part of the former to two or three of the latter. It is very important that the whole system of pipes and cylinders should be fully charged, and that no air should be present.

This being the case, it is necessary to provide for the expansion and contraction of the fluid due to changes of temperature. For this purpose, a valve "I" is fitted at mid-position of the cylinder, a section of which is shown. It contains each an inlet "L" and outlet valve "P". The outlet is simply an ordinary safety-valve loaded above the working pressure, which is about 150 pounds per square inch.

When the temperature rises, as in the case of the sun shining on the pipes, a portion of the fluid is blown through outlet valve "P" into the tank "O," and when the temperature falls, the fluid contracts and takes in the necessary quantity through the inlet valve "L".

The entire telemotor in the pilot house is constructed of gun metal, so as not to affect the compass. The motor-cylinder aft is of similar material, and the pipes are of solid drawn copper, of  $\frac{7}{8}$  inch diameter.

They are easily run, and may be bent into any number of corners without in the least adding to the friction of the gear. It will, therefore, be seen that this form of the telemotor, when the ships are large and the line of communication from the bridge to the stern is very irregular and tortuous, is very much to be preferred.

## Instructions for Filling, Working, and Adjusting

IT is of the utmost importance in this apparatus that all joints be watertight, as any leakage will empty the small tank "O." After all the pipes are coupled and the connections made to the cylinders and to the tank "O" in the wheelhouse, close the cock underneath the tank and fill to about one-third full with fresh water, and for cold climates add 30 per cent. of refined glycerine, which keeps the parts lubricated and will resist frost to about zero Fahrenheit. (See table of freezing temperatures of various mixtures of water and glycerine.) Put the hand wheel in mid gear, which will be seen by the pointer coming between the two zero marks on indicator. This opens a by-pass between the top and the bottom ends of the cylinder, and allows the whole system to be charged by one operation from the after part of the ship.

Open the valve "A" on the under side of the cylinder "B," after coupling on the discharge pipe "C" from the charging pump "D" the suction pipe "E" being connected to the tank "F," a piece of pipe "G" connecting the valve "H" on top of the cylinder to the tank. The end of this must just come over the filter "X" in tank "F." Open the valve "H" on top and commence pumping, great care being taken that the liquid in tank "F" never gets so low as to allow the pump to draw air, as the good working of the gear depends on the air being expelled. The liquid will shortly be seen to run from the small pipe "G" back into the tank "F;" but the pumping must be continued for some time, say three times as long as it took to begin to come back. By this time the air should have nearly all been driven out, and each stroke of the pump "D" should show a corresponding rush, and not a continuous flow back through the return pipe "G."

Being satisfied as to this, the valve "H" on the top of the cylinder should be closed, and a slight but continuous strain kept on the pump "D." Now go forward to the wheel-house, and on the valve casing cover stop off "I" on the cylinder "J" will be seen a brass plug "K;" remove it and press down the spindle of the inlet valve "L," which is immediately underneath, when the liquid will rush up owing to the pressure being kept on by the pump "D" from aft. When the

casing is quite full and no more air bubbles up, screw in the plug "K." Also the plug "M" on top of forward cylinder should be slacked back to allow any air imprisoned in the cylinder to escape; then tighten up plug "M." Open the valve underneath the tank "O" and close "A" on the under side of the after motor cylinder "B," when the telemotor will be fully charged and ready to use. The tank "O" in the wheel-house should always be kept at least half full, and the valve on the bottom of it must always be open when the telemotor is in use.

The gear may now be tried by putting the wheel over to port and starboard, and noticing aft if a corresponding movement takes place in the piston of the after motor cylinder. Should it not respond on one side or the other, than an internal leakage may be suspected; in which case examine the leathers in telemotor and motor cylinder.

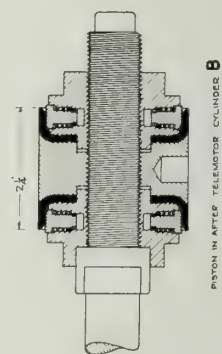
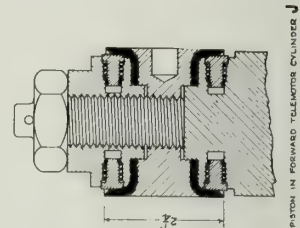
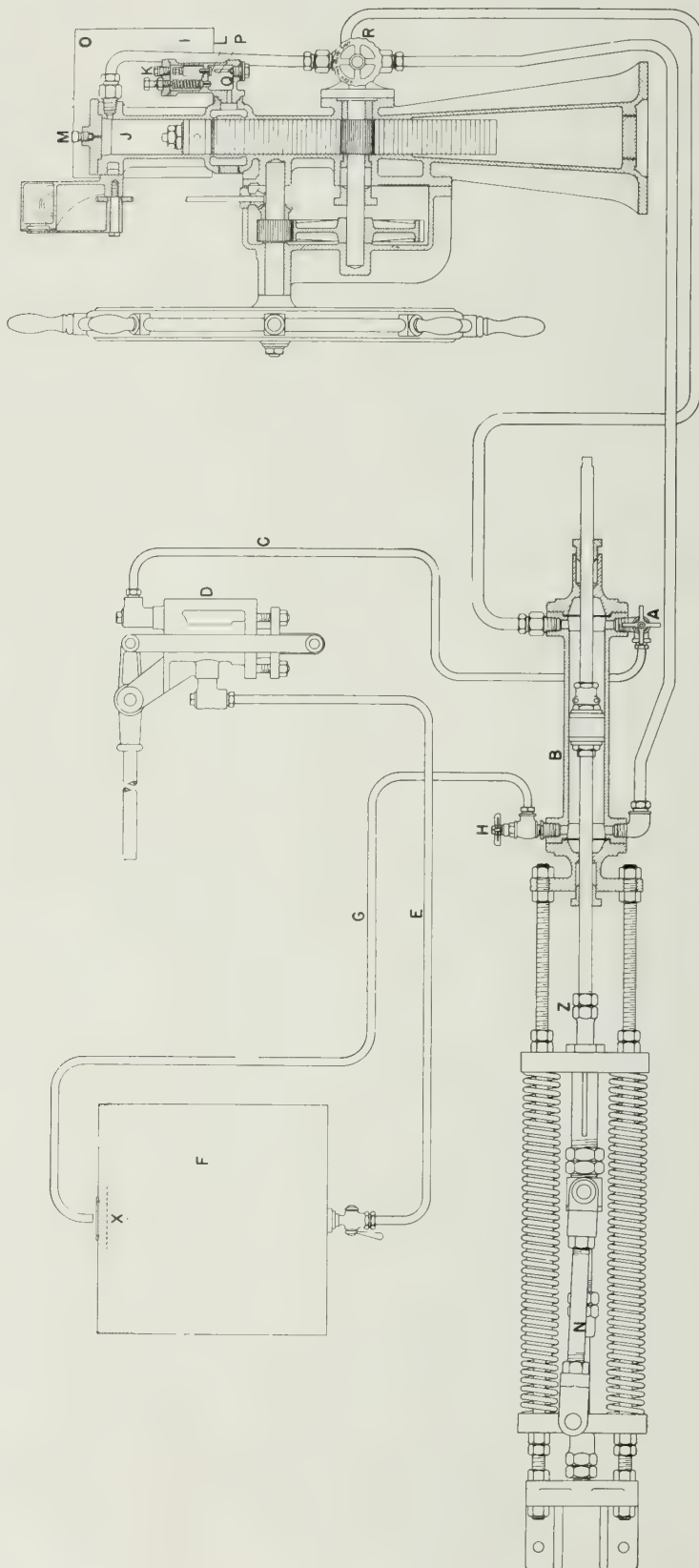
The inlet and outlet vales "L" and "P" are not working valves, but merely open and close as occasion requires, to allow for expansion and contraction of the fluid in the pipes, due to change of temperature.

The leathers in the pistons themselves will not cause any trouble until actually worn out, and even when in a leaky condition will work quite well and keep in correspondence with the gear aft in viture of the spring always putting the gear into the central position when the forward piston enters the by-pass portion of the cylinder.

After having made any repairs that may be necessary, and before re-charging, it is advisable to clean out the pocket "Q" that is placed underneath the valve casing "I" on the bridge telemotor, for the purpose of collecting any dirt or sediment that may be in the liquid. This is done by removing the brass plug in the bottom, when the small quantity of liquid that flows out of the pocket will carry anything with it. "X" is a small portable filter to prevent dirt or other foreign matter from getting into the system, and it should always be in place when pumping up or filling the tank.

It frequently happens that owing to the action of the propeller, the ship requires a few degrees of port or starboard helm, which will be shown by





the indicator on the bridge. If this is so, the connecting rod "N" to the steering gear valve should be lengthened or shortened as the case may be, and the spring aft will then, when adjusting, give the necessary permanent bias to the rudder, while the indicator on the bridge will show the gear amidships — that is, steering as if the propeller had no influence on the ship's course.

The capacity of the telemotor apparatus on the bridge is nearly double that of the motor cylinder aft, so that the ship could be steered on a course quite well when the indicator showed 45°, and the rudder fore and aft. This might happen with a very leaky and worn-out leather, but still the ship could be steered perfectly.

If the wheel is put to zero by the indicator, the gear aft will immediately get into correspondence, although for a moment the ship would be put slightly off her course. In confined waters or tortuous passages, in such an emergency the hand-by-pass valve "R" can be used to effect the same object without interfering with the steering of the ship, by opening it and running the wheel to zero, care being taken to close it again. This, however, should never be used unless absolutely necessary, as quartermasters may try it out of curiosity, and, of course, if they leave the valve open, the communication from the bridge to the gear aft becomes inoperative.

So far as is known this valve has not been required for this purpose, but is placed there in view of an emergency as indicated above, and so that, when in dock or other place when the gear is not being used, it may be opened and the wheel can then be moved from hard-over to hard-over without doing any injury to the gear.

In addition to the stuffing box of this valve, there are only three more — one on the cylinder on the bridge and two aft — and as the water pressure never exceeds 250 lbs. per square inch, there is no reason for any serious loss of the fluid in the tank. Keep the stuffing boxes *full* of greasy cotton packing, and screw up as lightly as is necessary to secure *tightness* but not *stiffness*. It is advisable to occasionally examine the leathers in the telemotor and motor cylinder aft when the ship is in port. The necessity for this can be ascertained by pulling the steering wheel hard-over to port, and securing it there. The motor cylinder will

be found to have responded to the same extent. If the gear is now left, say for half-an-hour, the spring at the motor cylinder will have moved the piston towards the midship position if there is any leakage in these leathers. A similar trial may be made to starboard, which will test these leathers. To examine the leathers in the forward cylinder, it is only necessary to open the by-pass valve "R," remove the nuts from the cylinder cover, and then turn the piston right up by means of the hand wheel. In the case of the after leathers, let go the large nuts "Z," remove back cylinder cover and push piston out, closing the circuit valves to prevent loss of fluid. The circuit valve on back end of cylinders should be closed before removing the cover, and the other one after the piston is out.

It need not be required that these leathers should be absolutely tight, but the motor piston should remain over for, say, ten minutes without any serious movement toward midship position, that being about the maximum time that, in practice, a helm would be held hard-over; and so any little deviation due to leaky leathers would be at once adjusted when the steering wheel is put to amidships, the motor springs putting the gear back to zero, through the by-pass allowing the free circulation of the fluid.

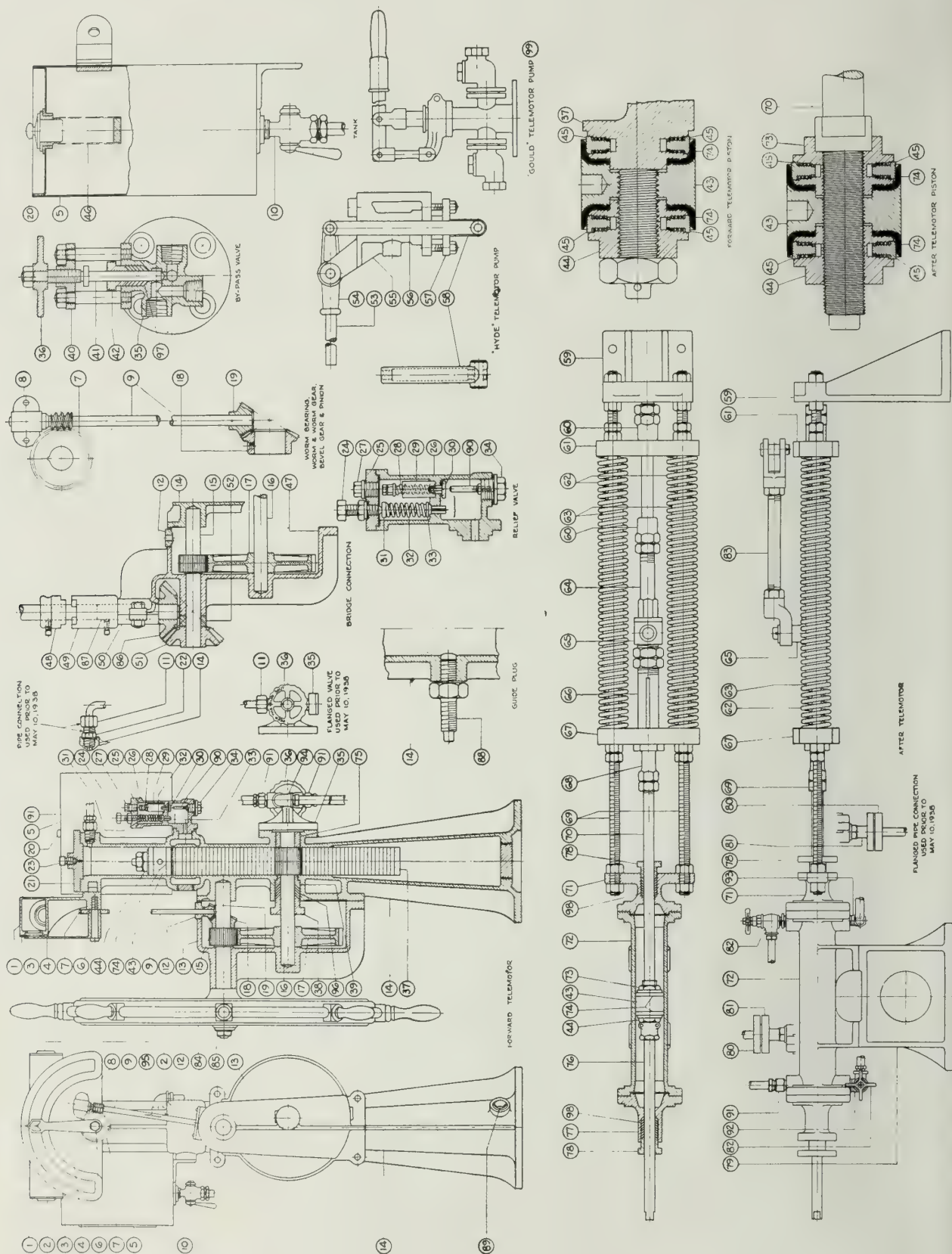
Care should be taken to lubricate with good oil the various working parts of the gear.

Great care should be taken when fitting new leathers to the transmitting cylinder that have not been obtained direct from Hyde Windlass Company, that these leathers are not longer over their edges than shown on illustration, or the automatic by-pass will be rendered ineffective.

Opening valve "R" will assist charging system quickly but valve "R" must be kept closed when telemotor is in operation.

#### NON-FREEZING FLUIDS FOR TELEMOTORS

Water containing Refined Glycerine.	Safe to work at Fahrenheit
25%	+18°
33%	+10°
50%	-20°
60%	-30°, getting thick.
70%	Too thick to work at -25°.
Telemotor Oil of viscosity 100 to 108 and minus zero pour is also used.	





# LIST OF PARTS

1. INDICATOR PLATE
2. ELECTRIC LIGHT HOLDER
3. INDICATOR PLATE COVER
4. POINTER
5. TANK WITH BRACKETS
6. INDICATOR POINTER BOLT
7. INDICATOR WORM GEAR
8. INDICATOR WORM BEARING
9. INDICATOR WORM AND SHAFT
10. STOP COCK COMPLETE
11. PACKING NUT
12. INDICATOR WORM SHAFT CAP
13. SPUR GEAR CASING AND BEARING
14. FORWARD TELEMOTOR CYLINDER AND STAND
15. SPUR PINION AND SHAFT
16. RACK PINION AND SHAFT
17. SPUR GEAR
18. INDICATOR WORM SHAFT BEVEL GEAR
19. INDICATOR WORM SHAFT BEVEL PINION
20. STRAINER PLUG
21. FORWARD TELEMOTOR CYLINDER COVER
22. COUPLING
23. COVER PLUG
24. ESCAPE VALVE SET SCREW
25. RELIEF VALVE HEAD
26. RELIEF VALVE BODY
27. SUCTION VALVE PIPE PLUG
28. SUCTION VALVE SPRING
29. SUCTION VALVE FERRULE
30. SUCTION VALVE
31. ESCAPE VALVE UPPER PART
32. ESCAPE VALVE SPRING
33. ESCAPE VALVE LOWER PART

34. PIPE PLUG
35. BY-PASS VALVE
36. HAND WHEEL
37. PINION RACK
38. GLAND
39. GLAND BUSHING
40. CONTROLLING NUT
41. VALVE ROD
42. VALVE GLAND
43. PISTON CENTER
44. PISTON END
45. SEGMENT OF PISTON RING
46. STRAINER COMPLETE
47. SPUR GEAR CASING AND BEARING WITH BRACKET AND BEARING FOR OVER-HEAD CONNECTION
48. CLUTCH, UPPER PART
49. CLUTCH, LOWER PART
50. BEARING CAP
51. MITER GEAR ON HORIZONTAL SHAFT
52. COLLAR
53. HANDLE
54. HANDLE SOCKET
55. PUMP BODY
56. SIDE LINK
57. PUMP BODY STUFFING GLAND
58. PLUNGER
59. SIDE ROD BRACKET
60. STOP NUT
61. SPRING BEARING YOKE
62. SPRING
63. SIDE ROD SLEEVE
64. PISTON ROD SECTION, 35 $\frac{1}{8}$ " LONG
65. PISTON ROD KNUCKLE
66. PISTON ROD SLIDE

67. SPRING BEARING YOKE
68. STOP NUT
69. SIDE ROD
70. PISTON ROD SECTION, 25 $\frac{3}{4}$ " LONG
71. CYLINDER COVER, STUFFING BOX AND YOKE
72. AFTER TELEMOTOR CYLINDER
73. PISTON END
74. PISTON LEATHER
75. BUSHING
76. PISTON ROD SECTION, 19 $\frac{1}{8}$ " LONG
77. CYLINDER COVER AND STUFFING BOX
78. STUFFING BOX GLAND
79. CYLINDER BRACKET
80. PIPE FITTING
81. NIPPLE
82. CYLINDER STOP VALVE, COMPLETE
83. CONNECTING LINK
84. WOOD STEERING WHEEL
85. STEERING WHEEL NUT
86. MITER GEAR ON VERTICAL SHAFT
87. OVERHEAD CONNECTION SHAFT
88. GUIDE PLUG
89. BASE PLUG
90. SUCTION VALVE STOP
91. COUPLING
92. SPECIAL STREET ELL
93. ELBOW
94. ELBOW
95. ELBOW
96. PINION SHAFT PACKING
97. BY-PASS VALVE PACKING
98. PISTON ROD PACKING
99. "GOULD" TELEMOTOR PUMP



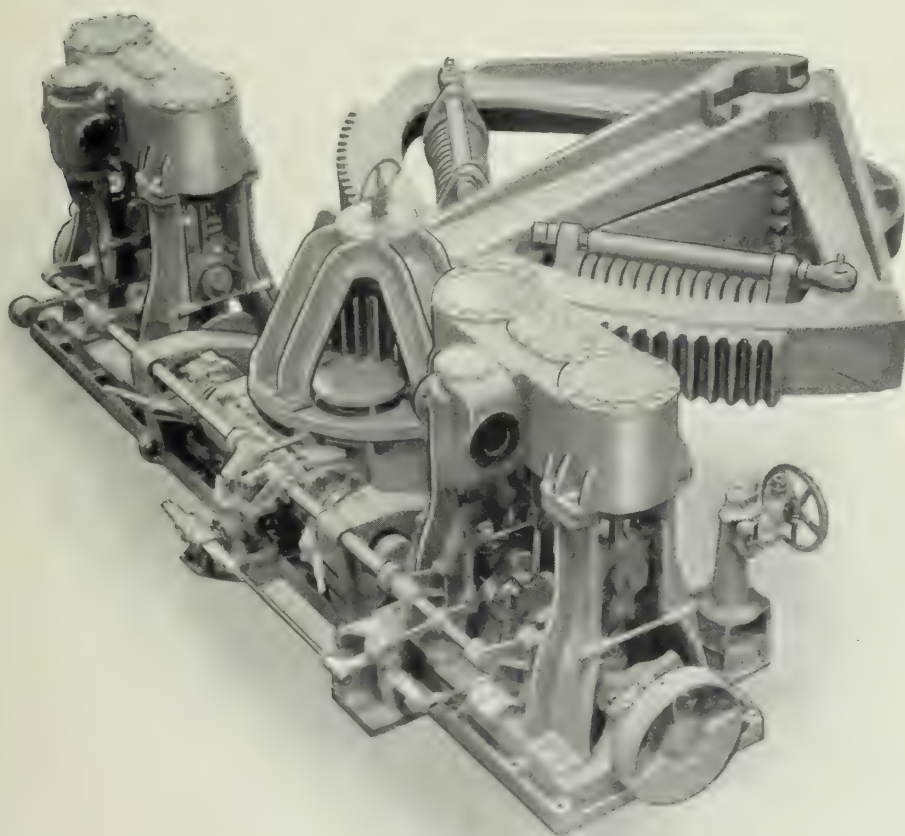
K-7

**HYDE**  
**STEAM STEERING GEAR**  
**STEAM WINDLESS**  
**STEAM WARPING WINCH**

*Standard Oil Types*

**Installed on**

**U.S.S. AO 23 Class and U.S.S. AO 51 Class**



**HYDE WINDLASS COMPANY**  
**Bath, Maine**

No. 26



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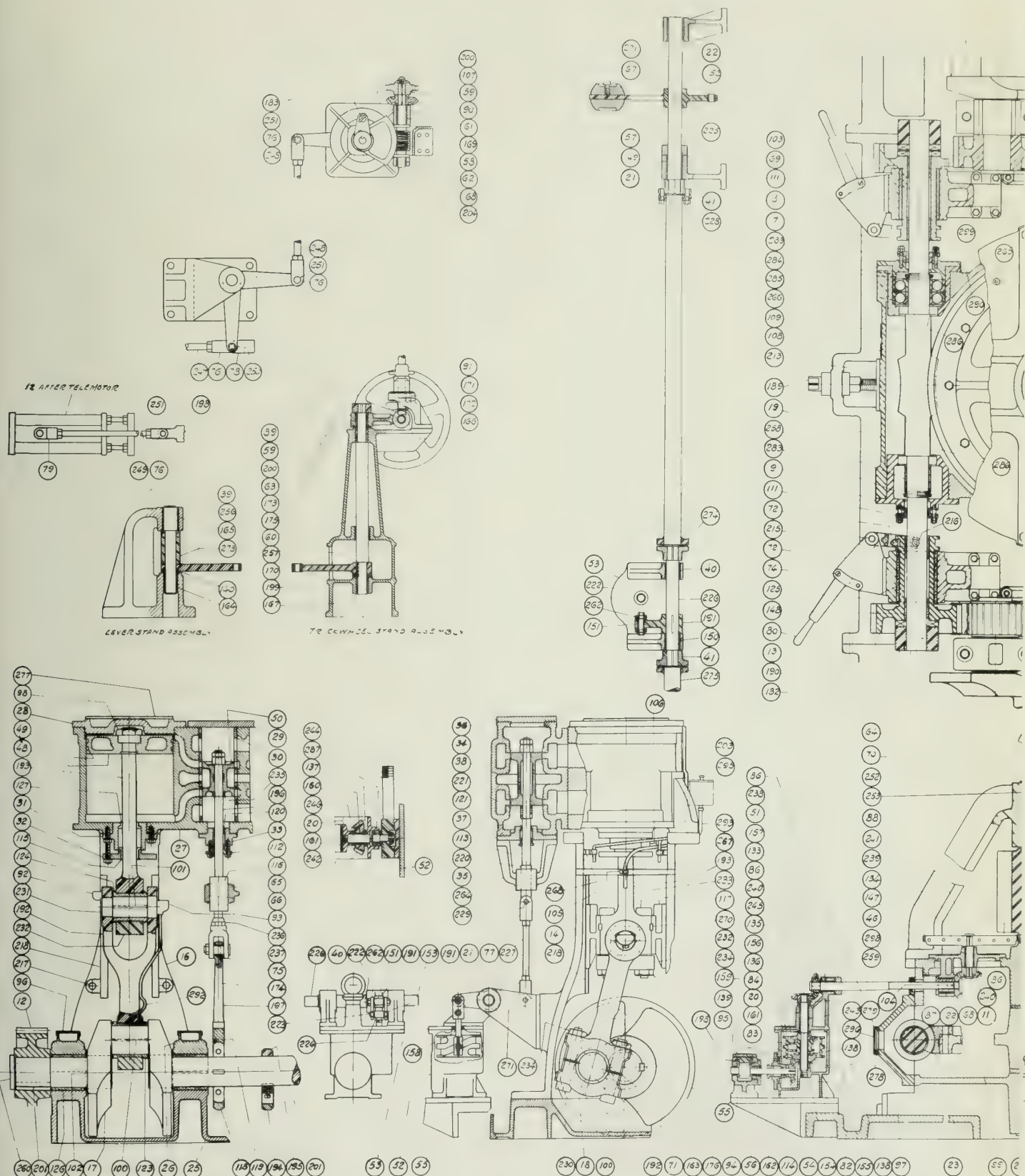
# HYDE STEAM STEERING GEAR

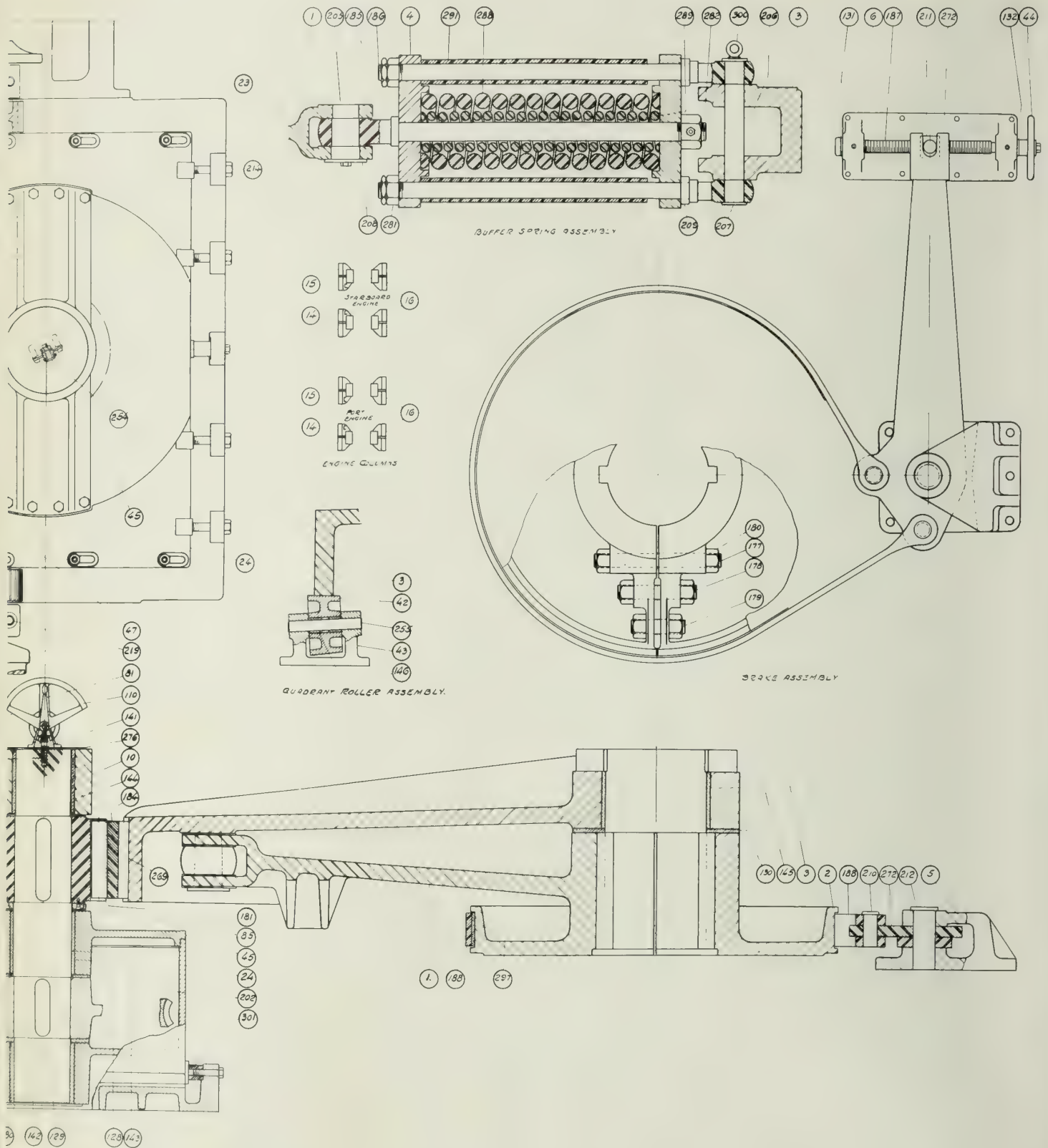
## Quadrant Type

**T**HE STEERING GEAR illustrated on cover and shown in sectional views by line cut on pages 3 and 4, with list of parts on page 5, is equipped with two 16" x 12" vertical engines. The engines are connected through spur gearing to worm shaft and clutches are provided for disconnecting either engine. One engine is capable of steering the ship at full speed, putting the rudder from hardover to hardover in 30 seconds. In case of emergency steering gear being used, the pinion in mesh with the quadrant can be disconnected by slacking off bolts in base of gear housing and jacking the gear housing forward by means of a screw. Hydraulic telemotor transmission is used for operating the steering engine control which is of the full travel, follow-up type. Tiller is keyed to rudder stock and the quadrant free to turn on same. Springs are interposed between tiller and quadrant. These springs are intended to relieve any shock which might come on rudder caused by vessel backing into mud or heavy sea striking the rudder.

### LUBRICATION

Tiller .....	Grease	Medium Grade
Gear Teeth .....	Gear Grease	
Worm Gear Casing.....	Oil	S.A.E. 160
Differential Gear Casing.....	Oil	S.A.E. 40
Crank Shaft Bearings.....	Oil	S.A.E. 40
Main Pinion Shaft Bearings.....	Grease	Medium Grade
Clutch Bearing.....	Grease	Medium Grade
Control Shaft Bearings.....	Grease	Medium Grade
Crank Pins .....	Mechanical Oilers on Engine	
Wrist Pins.....	Compounded Marine Engine	
Crosshead Slides.....	Oil	N.D. Spec. 4065
Eccentrics.....	Oil	S.A.E. 40
Valve Stem Guides.....	Oil	S.A.E. 40



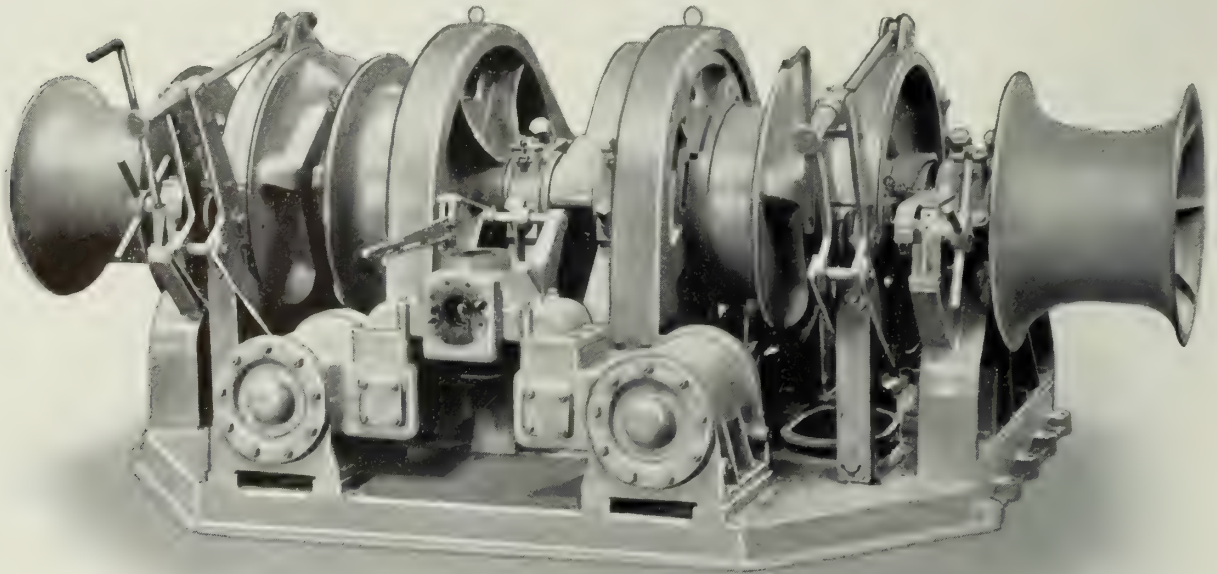




# LIST OF PARTS

PC. NO.	DESCRIPTION	PC. NO.	DESCRIPTION	PC. NO.	DESCRIPTION
1.	TILLER	102.	LINER	203.	MULTIPLE OILER BRACKET
2.	TILLER CAP	103.	LINER	204.	WORM SHAFT (R. H. WORM)
3.	QUADRANT	104.	LINER	205.	PIN
4.	YOKE	105.	TUBING CLIP	206.	PIN
5.	FRICTION STEP	106.	TUBING SPREADER (HALF)	207.	PIN CAP
6.	FRICTION SCREW BEARING	107.	$\frac{7}{8}$ " CAP NUT	208.	PIN CAP
7.	BALL BEARING CAGE	108.	OIL PLATE	209.	DISTANCE PIECE
8.	BEARING RETAINER & STUFFING BOX	109.	OIL LEVEL PLATE	210.	FRICTION BAND PIN
9.	ROLLER BEAR. CAGE & STUFFING BOX	110.	RUDDER INDICATOR SCALE	211.	FRICTION SCREW NUT
10.	SPRING BEARING	111.	STUFFING BOX GLAND	212.	FRICTION STEP PIN
11.	WORM GEAR CENTER	112.	VALVE ROD STUFFING BOX GLAND	213.	COLLAR
12.	SPUR PINION	113.	STUFFING BOX GLAND	214.	WORM GEAR CASING
13.	SPUR GEAR	114.	STUFFING BOX GLAND	215.	FULCRUM PIN
14.	ENGINE COLUMN	115.	PISTON ROD STUFFING BOX GLAND	216.	CLUTCH LEVER PIN
15.	ENGINE COLUMN	116.	VALVE STEM GUIDE GIB	217.	TIE ROD
16.	ENGINE COLUMN	117.	CROSSHEAD GUIDE GIB	218.	OIL KEEPERS
17.	ENGINE CRANK	118.	ECCENTRIC STRAP (BOTTOM HALF)	219.	BEARING STUD
18.	CONNECTING ROD CAP	119.	ECCENTRIC STRAP (TOP HALF)	220.	CONTROL VALVE STEM
19.	WORM SHAFT COVER	120.	VALVE ROD STUFFING BOX BUSHING	221.	VALVE STOP
20.	CONTROL ROLLER RACE	121.	CONTROL VALVE STEM STUFF. BOX BUSH.	222.	SHOULDER BOLT
21.	ROCKER SHAFT BEARING	122.	BEARING BOX	223.	LINK TRUNNION
22.	ROCKER SHAFT BEARING	123.	CONNECTING ROD BOX	224.	LINK TRUNNION LOCKNUT
23.	MAIN BEDPLATE	124.	CROSSHEAD BOX (HALF)	225.	ROCKER SHAFT — END
24.	WORM GEAR CASING	125.	BEARING BOX	226.	ROCKER SHAFT — CENTER
25.	ENGINE BEDPLATE	126.	CRANKSHAFT BEARING BOX	227.	VALVE CONN. LINK ROD
26.	CRANK SHAFT BEARING CAP	127.	PISTON ROD STUFFING BOX	228.	COUPLING BOLT
27.	CYLINDER DOUBLE (MODIFIED)	128.	THRUST COLLAR	229.	LINK PIN
28.	CYLINDER COVER	129.	THRUST COLLAR	230.	CONNECTING ROD BOLT
29.	PISTON VALVE COVER	130.	COLLAR	231.	CROSSHEAD PIN
30.	PISTON VALVE LINER (MODIFIED)	131.	COLLAR	232.	CROSSHEAD BINDER
31.	PISTON ROD STUFFING BOX	132.	COLLAR	233.	CROSSHEAD BOLT
32.	PISTON ROD STUFFING BOX GLAND	133.	COLLAR	234.	CROSSHEAD AND CONNECT, ROD BOLT NUT
33.	VALVE STEM STUFFING BOX	134.	COLLAR	235.	VALVE STEM COLLAR
34.	CONTROL VALVE BODY	135.	COLLAR	236.	VALVE STEM NUT
35.	CONTROL VALVE STEM GUIDE	136.	COLLAR	237.	KNUCKLE PIN
36.	CONTROL VALVE COVER	137.	COLLAR	238.	HORIZONTAL FOLLOW-UP SHAFT
37.	CONTROL VALVE COVER WITH STUFFING BOX	138.	COLLAR	239.	VERTICAL FOLLOW-UP SHAFT
38.	CONTROL VALVE	139.	COLLAR	240.	SHAFT CAP
39.	LEVER STAND	140.	COLLAR	241.	SHAFT CAP
40.	ROCKER SHAFT BEARING	141.	COLLAR	242.	BEVEL PINION
41.	COUPLING (HALF)	142.	BUSHING	243.	DIFF. CONTROL SHAFT
42.	ROLLER	143.	BUSHING	244.	DIFF. CONTROL SPINDLE
43.	ROLLER SUPPORT	144.	BUSHING	245.	SHAFT CAP
44.	FRICTION HANDWHEEL	145.	BUSHING	246.	DIFF. PINION PIN
45.	WORM GEAR CASING COVER	146.	BUSHING	247.	LINK ROD
46.	COVER & FOLLOW-UP SHAFT BEARING	147.	BUSHING	248.	LINK ROD
47.	WORM SHAFT BEARING	148.	BUSHING	249.	TELE MOTOR LINK ROD
48.	PISTON	149.	BUSHING	250.	LINK PIN (LONG)
49.	PISTON RING	150.	BUSHING	251.	LINK PIN (SHORT)
50.	PISTON VALVE	151.	BUSHING	252.	PINION
51.	STANDARD COLLAR	152.	BUSHING	253.	PINION SHAFT
52.	DIFF. GEAR CASING	153.	BUSHING	254.	GEAR SHAFT
53.	DIFF. GEAR CASING COVER	154.	BUSHING	255.	ROLLER SHAFT
54.	CONTR. PINION SHAFT BEARING & STUFF. BOX	155.	BUSHING	256.	LEVER STAND SHAFT
55.	DIFF. CONTROL UNIT BRACKET	156.	BUSHING	257.	WORM SECTOR SHAFT
56.	CONTROL PINION SHAFT BEARING	157.	BUSHING	258.	DISTANCE PIECE
57.	COLLAR	158.	BUSHING	259.	CONTROL SHAFT OIL SEAL RETAINER
58.	MITER GEAR BEARING	159.	BUSHING	260.	CRANK SHAFT CAP
59.	TRICKWHEEL	160.	BUSHING	261.	PINCH BAR
60.	TRICKWHEEL STAND	161.	BUSHING	262.	LINK
61.	WORM SHAFT BEARING	162.	BUSHING	263.	HANDWHEEL LEVER
62.	WORM SHAFT BEARING	163.	BUSHING	264.	VALVE STEM GUIDE COVER
63.	WORM SECTOR	164.	BUSHING	265.	VENT PLUG
64.	INDICATOR BRACKET	165.	BUSHING	266.	DISTANCE PIECE
65.	VALVE STEM GUIDE	166.	BUSHING	267.	TUBING CLIP BRACKET
66.	VALVE STEM GUIDE CAP	167.	BUSHING	268.	TUBING CLIP ANGLE BRACKET
67.	COUNTERWEIGHT	168.	BUSHING	269.	KEY
68.	FOLLOW-UP SHAFT BEARING CAP	169.	BUSHING	270.	GIB KEY
69.	WORM SHAFT BEARING CAP	170.	BUSHING	271.	VALVE CONTROL LEVER
70.	BEVEL GEAR	171.	BUSHING	272.	FRICTION LEVER
71.	PINCH WHEEL	172.	BUSHING	273.	12" DOUBLE LEVER
72.	LEVER QUADRANT	173.	BUSHING	274.	ROCKER SHAFT
73.	CLUTCH LEVER YOKE	174.	ECCENTRIC ROD BUSHING	275.	ROCKER SHAFT
74.	LOCKING PIN	175.	FLANGED BUSHING	276.	HUB CAP
75.	VALVE STEM KNUCKLE	176.	CONTROL PINION SHAFT	277.	CYLINDER COVER LAGGING
76.	KNUCKLE	177.	STUD BOLT	278.	SIGHT GLASS FRAME
77.	KNUCKLE	178.	STUD BOLT	279.	SIGHT GLASS RETAINER
78.	KNUCKLE	179.	STUD BOLT	280.	HUB CAP
79.	KNUCKLE	180.	2 1/2" NUT	281.	3" NUT
80.	LEVER	181.	MAIN PINION	282.	3 1/2" NUT
81.	INDICATOR POINTER	182.	WORM SHAFT	283.	LOCKNUT
82.	MITER GEAR	183.	LOCKING PIN	284.	LOCKWASHER
83.	DOUBLE BEVEL GEAR	184.	TOOTH SEGMENT	285.	BALL BEARING
84.	BEVEL GEAR	185.	TILLER ROD	286.	SPHERICAL ROLLER BEARING
85.	FOLLOW-UP PINION	186.	QUADRANT ROD	287.	ROLLER BEARING & PIN
86.	MITER GEAR	187.	FRICTION SCREW	288.	SPRING
87.	MITER GEAR	188.	FRICTION BAND	289.	SPRING
88.	FOLLOW-UP GEAR (HALF)	189.	JACK SCREW	290.	WORM SHAFT BALL BEARING CAGE SHIM
89.	MITER GEAR	190.	CLUTCH	291.	PIPE
90.	MITER GEAR	191.	DIFF. CONTROL LEVER	292.	COPPER TUBING
91.	CLUTCH	192.	CONNECTING ROD	293.	COPPER TUBING
92.	CROSSHEAD PIN OIL CUP	193.	PISTON ROD AND CROSSHEAD	294.	1/8" ALEMITE GREASE FITTING PIN TYPE
93.	CRANK PIN OIL CUP	194.	ECCENTRIC SHEAVE (TOP HALF)	295.	MULTIPLE CAPILLARY OILER
94.	CONTROL RACK STAND	195.	ECCENTRIC SHEAVE (BOTTOM HALF)	296.	SIGHT GLASS
95.	CONTROL RACK STAND COVER	196.	VALVE STEM	297.	FRICTION BAND LINING
96.	OIL BOX COVER	197.	ECCENTRIC ROD	298.	OIL RETAINER "PERFECT"
97.	JACK SCREW NUT	198.	CONTROL RACK	299.	1/16" GASKET MATERIAL
98.	PISTON ROD NUT	199.	12" LEVER	300.	3/4" EYE BOLT
99.	WORM GEAR RIM	200.	4" LEVER	301.	WORM GEAR CASING STOP
100.	CONNECTING ROD LINER	201.	CRANK SHAFT (3 PIECES)	302.	OIL BOX COVER
101.	LINER	202.	MAIN VERTICAL SHAFT		

## HYDE STEAM WINDLASS



**T**HE STEAM WINDLASS is illustrated above and shown in sectional views by line cuts on pages 7 and 8. The list of parts is given on page 9. The engine is 12" x 15", reversible by means of a reversing valve and is capable of hoisting both anchors and chains simultaneously at an average speed of 30 feet per minute. The change gears on crank and intermediate shaft allow for two speeds for handling lines on the warping gypsies: 30 feet per minute for warping and 60 feet per minute for taking in slack line. The wildcats are designed for handling  $2\frac{3}{8}$ " stud-link chain. Each wildcat has a locking gear operated by hand wheel and is fitted with brake band operated by hand crank.

### LUBRICATION

Windlass, Intermediate and Crank Shaft Bearings . . .	Oil	S.A.E.	40
Crank Pins . . . . .	Compounded Marine Engine Oil	N. D. Spec.	4065
Wrist Pins . . . . .			
Crosshead Slides . . . . .			
Piston Rods and Valve Stems . . . . .			
Valve Stem Guides . . . . .			
Pinion Bushings . . . . .	Grease		Medium Grade
Wildcat Bushings . . . . .			
Friction Brake Mechanism . . . . .			
Wildcat Locking Mechanism . . . . .			
Eccentrics . . . . .			
Gear Teeth . . . . .	Gear Grease		
Reverse Valve Control . . . . .	Oil	S.A.E.	40
Clutch Operating Mechanism . . . . .	Oil	S.A.E.	40



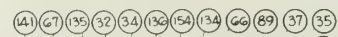




SCALE =  $1\frac{1}{2}$ " = 1 FT



SCALE  $\frac{1}{2}'' = 1 \text{ FT}$



SCALE  $\frac{1}{2}$  IN = 1 FT



SCALE -  $1\frac{1}{2}$ " = 1 FT



SCALE =  $1\frac{1}{2}$ " = FT

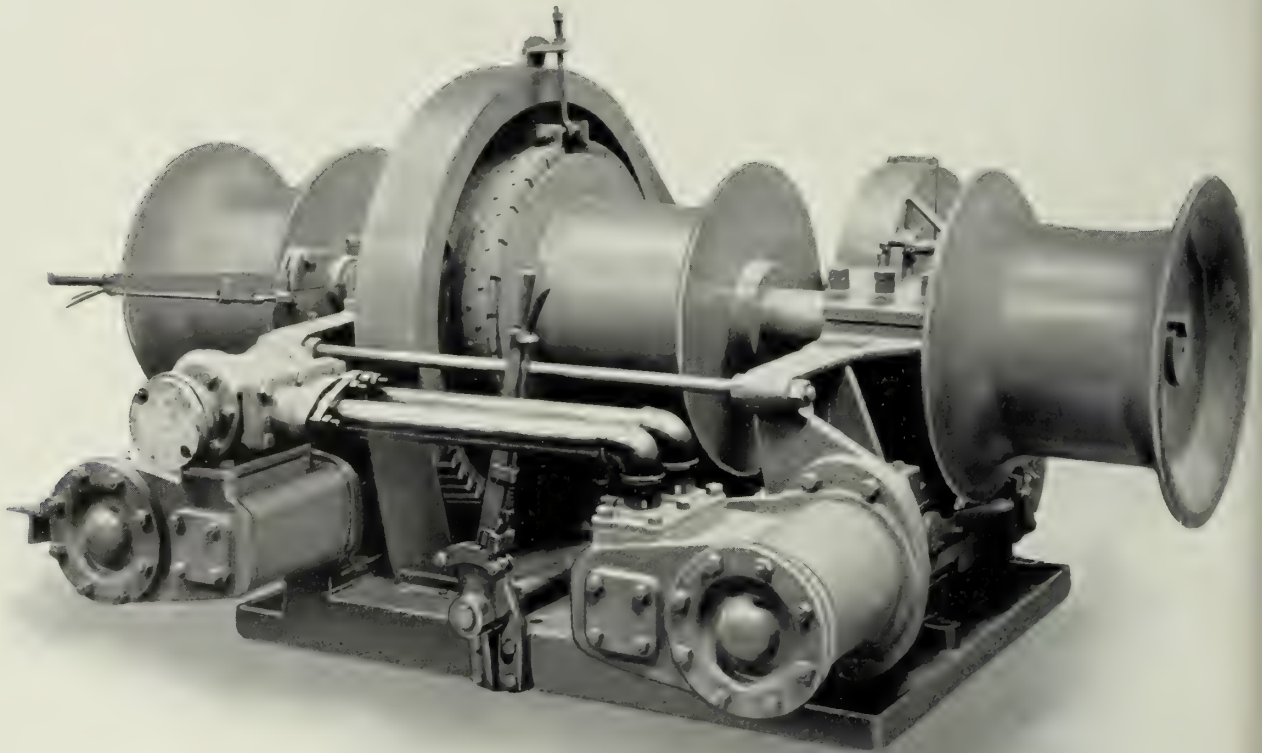


SCALE -  $1\frac{1}{2}$ " = 1' 1"

## LIST OF PARTS

PC. NO.	DESCRIPTION	PC. NP.	DESCRIPTION
1.	CRANK & COUNTER SHAFT BEARING	80.	CLUTCH SWIVEL
2.	CRANK & COUNTER SHAFT BEARING CAP	81.	PISTON ROD GLAND
3.	INTERMEDIATE SHAFT BEARING	82.	PISTON VALVE STEM GLAND
4.	INTERMEDIATE SHAFT BEARING CAP	83.	REVERSE VALVE STEM GLAND (1" B)
5.	OIL BOX	84.	CHAIN STOPPER PAWL PIN
6.	BED PLATE (PORT HALF)	85.	INTERMEDIATE SHAFT
7.	BED PLATE (STARBOARD HALF)	86.	COUNTER SHAFT
8.	CHAIN STOPPER BODY	87.	CONTROL SHAFT
9.	CHAIN STOPPER PAWL	88.	COLLAR
10.	MAIN SPUR GEAR	89.	QUADRANT DISTANCE PIECE
11.	SPUR GEAR	90.	PIN
12.	SPUR GEAR	91.	PIN
13.	WILDCAT	92.	PIN
14.	CENTER BITT	93.	FRICTION ROD NUT
15.	CENTER BITT	94.	COLLAR
16.	BEARING CAP	95.	COLLAR
17.	BEARING CAP	96.	PIN
18.	SIDE BITT WITH BRACKET	97.	PIN
19.	SIDE BITT WITH BRACKET	98.	ECCENTRIC ROD
20.	SIDE BITT BEARING CAP	99.	VALVE STEM KNUCKLE PIN
21.	FRICTION ANCHOR LUG	100.	CROSSHEAD PIN
22.	BELL CRANK LUG	101.	PISTON ROD
23.	FRICTION ROD NUT LUG	102.	PISTON ROD SPECIAL NUT
24.	HINGE LUG	103.	VALVE STEM
25.	CROSSHEAD	104.	GEAR
26.	CYLINDER	105.	SCREW LOCKING SHAFT
27.	CYLINDER	106.	HANDWHEEL SHAFT
28.	CYLINDER COVER	107.	FULCRUM PIN
29.	CYLINDER COVER & STUFFING BOX	108.	LOCKING LEVER FULCRUM BOLT
30.	STEAM CHEST COVER	109.	FULCRUM PIN
31.	VALVE STEM STUFFING BOX	110.	CHAIN STOPPER PAWL LIFTING EYE
32.	REVERSE VALVE BODY	111.	CHAIN STOPPER STOP
33.	REVERSE VALVE HEAD	112.	FRICTION ANCHOR LINK
34.	REVERSE VALVE	113.	HINGE LINK
35.	CONTROL SHAFT BEARING	114.	GIB (CRANK END)
36.	CONTROL SHAFT BEARING	115.	GIB (CROSSHEAD END)
37.	QUADRANT	116.	KEY (CRANK END)
38.	VALVE STEM GUIDE	117.	KEY (CROSSHEAD END)
39.	VALVE STEM GUIDE COVER	118.	CROSSHEAD SLIDE
40.	ECCENTRIC STRAP (HALF)	119.	WASHER
41.	ECCENTRIC STRAP (HALF)	120.	LOCKING LEVER FULCRUM
42.	ECCENTRIC SHEAVE	121.	BELL CRANK
43.	CROSSHEAD GIB	122.	CROSSHEAD CAP
44.	CROSSHEAD SLIDE SUPPORT	123.	CRANK SHAFT
45.	PISTON	124.	CRANK PIN
46.	PISTON RING	125.	WINDLASS SHAFT
47.	PISTON VALVE	126.	MAIN SPUR PINION
48.	SCREW LOCKING SHAFT BEARING	127.	PINION, 18 TEETH
49.	FULCRUM PIN BRACKET	128.	PINION, 17 TEETH
50.	FULCRUM PIN BRACKET	129.	BELL CRANK TRUNNION
51.	HEAD	130.	FRICTION ANCHOR BOLT
52.	CRANK DISK	131.	CONNECTING ROD
53.	COLLAR	132.	CONNECTING ROD STRAP (CRANK END)
54.	OIL BOX COVER	133.	CONNECTING ROD STRAP (CROSSHEAD END)
55.	LINER	134.	LATCH
56.	LINER	135.	LATCH ROD
57.	LINER	136.	LATCH ROD GUIDE
58.	LOCKING PIN	137.	BELL CRANK LINK
59.	YOKE (HALF)	138.	LOCKING LEVER QUADRANT
60.	GIB	139.	QUADRANT (COMPLETE)
61.	FLOATING NUT	140.	REVERSE VALVE STEM
62.	WASHER	141.	REVERSE VALVE LEVER
63.	TOGGLE PIN	142.	REVERSE VALVE ARM
64.	OIL BOX COVER BINDER	143.	CHAIN CLEARER
65.	OIL BOX DROP BOLT	144.	BELL CRANK LINK
66.	LATCH GUIDE	145.	LOCKING HANDWHEEL
67.	LEVER GRIP	146.	FRICTION ROD CRANK
68.	VALVE STEM KNUCKLE	147.	FRICTION BAND HALF
69.	BEARING BOX	148.	LOCKING LEVER (COMPLETE)
70.	BEARING BOX	149.	CLUTCH LEVER (COMPLETE)
71.	BUSHING	150.	FRICTION ROD
72.	BUSHING	151.	VALVE STEM GUIDE BLOCK
73.	BUSHING	152.	DISTANCE PIECE
74.	BUSHING	153.	DISTANCE PIECE
75.	BUSHING	154.	LATCH SPRING
76.	BUSHING	155.	3/4" THUMB NUT
77.	BEARING BOX	156.	3/4" SQUARE PACKING, GARLOCK 90
78.	CRANK PIN BOX (HALF)	157.	REVERSE VALVE STEM KNUCKLE PIN
79.	CROSSHEAD PIN BOX (HALF)		

## STEAM WARPING WINCH



THE WARPING WINCH illustrated above and shown in sectional views by line cuts on page 11 and parts list on page 12 has 9" x 12" engines fitted with reversing valve. This winch is of the compound geared type with clutches provided on the crank and intermediate shaft in order to change from one speed to the other. The drum shown in photograph is omitted, but shaft is extended on each side having gypsies 20" diameter and drums grooved for  $\frac{3}{4}$ " wire rope used for emergency steering. This winch has a capacity of 16,000 lbs. at 100 feet per minute.

### LUBRICATION

Crank, Intermediate, Main and Head Shaft

Bearings.....	Oil	S.A.E. 40
Crank Pins.....	Compounded Marine Engine Oil	N. D. Spec. 4065
Wrist Pins.....		
Crosshead Slides.....		
Piston Rods and Valve Stems.....		
Valve Stem Guides.....		
Pinion Bushings.....	Grease	Medium Grade
Clutches.....		
Eccentrics.....		
Reverse Valve Control.....		
Clutch Operating Mechanism.....		



## LIST OF PARTS

NO.	DESCRIPTION
35.	REVERSE VALVE LINER
36.	REVERSE VALVE GLAND
37.	REVERSE VALVE PISTON VALVE
38.	REVERSE VALVE PISTON VALVE STEM
39.	EXHAUST REDUCER
40.	REVERSE ARM
41.	REVERSE SHAFT
42.	REVERSE LEVER SH. BEARING
43.	REVERSE LEVER QUADRANT
44.	REVERSE LEVER
45.	REVERSE LEVER LATCH
46.	REVERSE LEVER LATCH ROD
47.	REVERSE LEVER LATCH ROD GUIDE
48.	REVERSE LEVER LATCH SPRING
49.	REVERSE LEVER LATCH GUIDE
50.	REVERSE LEVER GRIP
51.	HEAD
52.	OUTBOARD BEARING
53.	OUTBOARD BEARING CAP
54.	OUTBOARD SH. BEARING BOX (HALF)
55.	MAIN SH. BEARING CAP
56.	CRANK SH. BEARING CAP
57.	INT. SH. BEARING CAP
58.	WIRE ROPE DRUM
59.	COUPLING HALF
60.	MAIN SPUR PINION BUSHING (CRANK SHAFT)
61.	MAIN SPUR PINION BUSHING (INT. SHAFT)
62.	FRAME
63.	FRAME
64.	TIE ROD
65.	MAIN SHAFT BEARING BOX
66.	CRANK SHAFT BEARING BOX (HALF)
67.	INT. SHAFT BEARING BOX (HALF)
68.	MAIN SPUR PINION (CRANK SHAFT)
69.	MAIN SPUR PINION (INT. SHAFT)
70.	INT. SPUR PINION
71.	MAIN SPUR GEAR
72.	INT. SPUR GEAR
73.	HEAD SHAFT
74.	HEAD SHAFT EXTENSION
75.	CRANK SHAFT
76.	INTERMEDIATE SHAFT
77.	CLUTCH (CRANK SHAFT)
78.	CLUTCH (INT. SHAFT)
79.	CLUTCH LEVER LINK BEARING
80.	CLUTCH LEVER LINK
81.	CLUTCH SWIVEL
82.	CLUTCH CONT. SHAFT BEARING
83.	CLUTCH CONT. SHAFT OUTBOARD BEARING
84.	CLUTCH LEVER
85.	CLUTCH CONT. SHAFT
86.	CLUTCH CONT. LEVER
87.	CLUTCH CONT. LEVER LATCH
88.	CLUTCH CONT. LEVER LATCH GUIDE
89.	CLUTCH CONT. LEVER LATCH ROD
90.	CLUTCH CONT. LEVER LATCH ROD GUIDE
91.	CLUTCH CONT. LEVER GRIP
92.	CLUTCH CONT. LEVER LATCH SPRING
93.	BEDPLATE
94.	EXPANSION JOINT BODY GLAND
95.	EXPANSION JOINT BODY
96.	PIPE FLANGE
97.	CYLINDER PIPE
98.	COLLAR
99.	QUADRANT
100.	OUTER QUADRANT
101.	COLLAR
102.	DISTANCE PIECE
103.	DISTANCE PIECE

### NO. DESCRIPTION

1. CYLINDER
2. CYLINDER
3. CYLINDER HEAD
4. STEAM CHEST COVER
5. PISTON ROD STUFFING BOX
6. PISTON ROD STUFFING BOX GLAND
7. PISTON (HALF)
8. PISTON RING
9. PISTON ROD
10. PISTON VALVE LINER
11. CROSSHEAD
12. CROSSHEAD BOX (HALF)
13. CROSSHEAD BOX (HALF)
14. CROSSHEAD SLIDES
15. CROSSHEAD BINDER
16. CONNECTING ROD BOX (HALF)
17. CONNECTING ROD BOX (HALF)
18. CONNECTING ROD
19. CONNECTING LINK
20. CRANK DISK
21. CRANK PIN
22. PISTON VALVE
23. VALVE STEM
24. VALVE STEM KNUCKLE
25. VALVE STEM STUFFING BOX
26. VALVE STEM STUFFING BOX GLAND
27. VALVE STEM GUIDE
28. VALVE STEM GUIDE CAP
29. ECCENTRIC ROD
30. ECCENTRIC SHEAVE
31. ECCENTRIC STRAP (HALF)
32. ECCENTRIC STRAP (HALF)
33. REVERSE VALVE BODY
34. REVERSE VALVE HEAD

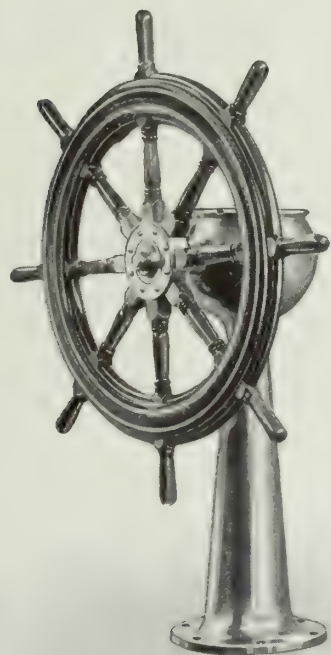
# ANCHORS and CHAINS

DI-LOC CHAIN					CAST STEEL CHAIN			
Weight Anchor Lbs.	Size Inches	Breaking Strength Lbs.	Proof Strength Lbs.	Weight 15 FTH.	Size Inches	Breaking Strength Lbs.	Proof Strength Lbs.	Weight 15 FTH.
560	$\frac{3}{4}$	7500	48000	490	* $\frac{3}{4}$	33880	22680	480
665	$\frac{13}{16}$				* $\frac{13}{16}$	39872	26600	570
770	$\frac{7}{8}$	98000	64000	680	* $\frac{7}{8}$	46200	30800	655
875	$\frac{15}{16}$				* $\frac{15}{16}$	53088	35392	755
1015	1	129000	84000	890	*1	60480	40320	855
1190	$1\frac{1}{16}$				* $1\frac{1}{16}$	68096	45472	970
1365	$1\frac{1}{8}$	161000	106000	1130	* $1\frac{1}{8}$	76440	50960	1085
1575	$1\frac{3}{16}$				* $1\frac{3}{16}$	85120	56840	1215
1785	$1\frac{1}{4}$	198000	130000	1400	* $1\frac{1}{4}$	94360	63000	1345
2800	$1\frac{5}{16}$				* $1\frac{5}{16}$	104160	69440	1485
3150	$1\frac{3}{8}$	235000	157000	1690	$1\frac{3}{8}$	156330	111660	1625
3815	$1\frac{7}{16}$				$1\frac{7}{16}$	170430	121720	1775
4130	$1\frac{1}{2}$	280000	185000	2010	$1\frac{1}{2}$	185060	132190	1935
4445	$1\frac{9}{16}$				$1\frac{9}{16}$	200270	143050	2090
4725	$1\frac{5}{8}$	325000	216000	2325	$1\frac{5}{8}$	216030	154310	2235
5110	$1\frac{11}{16}$				$1\frac{11}{16}$	232360	165960	2410
5600	$1\frac{3}{4}$	379000	249000	2695	$1\frac{3}{4}$	249210	178000	2590
6580	$1\frac{13}{16}$				$1\frac{13}{16}$	266620	190430	2785
7070	$1\frac{7}{8}$	432000	285000	3095	$1\frac{7}{8}$	284540	203250	2975
7665	$1\frac{15}{16}$				$1\frac{15}{16}$	303000	216430	3175
8225	2	488000	322000	3490	2	322000	230000	3355
8855	$2\frac{1}{16}$				$2\frac{1}{16}$	341510	243930	3570
9415	$2\frac{1}{8}$	548000	362000	3935	$2\frac{1}{8}$	361530	258240	3785
10045	$2\frac{3}{16}$				$2\frac{3}{16}$	382060	272910	4015
10640	$2\frac{1}{4}$	610000	403000	4415	$2\frac{1}{4}$	403100	287930	4245
12005	$2\frac{5}{16}$				$2\frac{5}{16}$	424630	303320	4485
12740	$2\frac{3}{8}$	675000	447000	4915	$2\frac{3}{8}$	446660	319050	4725
13370	$2\frac{7}{16}$				$2\frac{7}{16}$	469180	335130	4960
14105	$2\frac{1}{2}$	744000	492000	5475	$2\frac{1}{2}$	492190	351560	5265
14805	$2\frac{9}{16}$				$2\frac{9}{16}$	515670	368340	5535
15575	$2\frac{5}{8}$	813000	540000	6050	$2\frac{5}{8}$	539620	385440	5815
16345	$2\frac{11}{16}$				$2\frac{11}{16}$	564040	402890	6105
17990	$2\frac{3}{4}$	888000	589000	6660	$2\frac{3}{4}$	588930	420660	6405
18900	$2\frac{13}{16}$				$2\frac{13}{16}$	614260	438760	6705
19810	$2\frac{7}{8}$	965000	640000	7295	$2\frac{7}{8}$	640070	457190	7015
20685	$2\frac{15}{16}$				$2\frac{15}{16}$	666310	475940	7330
21560	3	1045000	693000	7955	3	693000	495000	7650

\* Wrought iron chain.

# **HYDE**

## **STEAM AND ELECTRIC DRUM STEERERS**



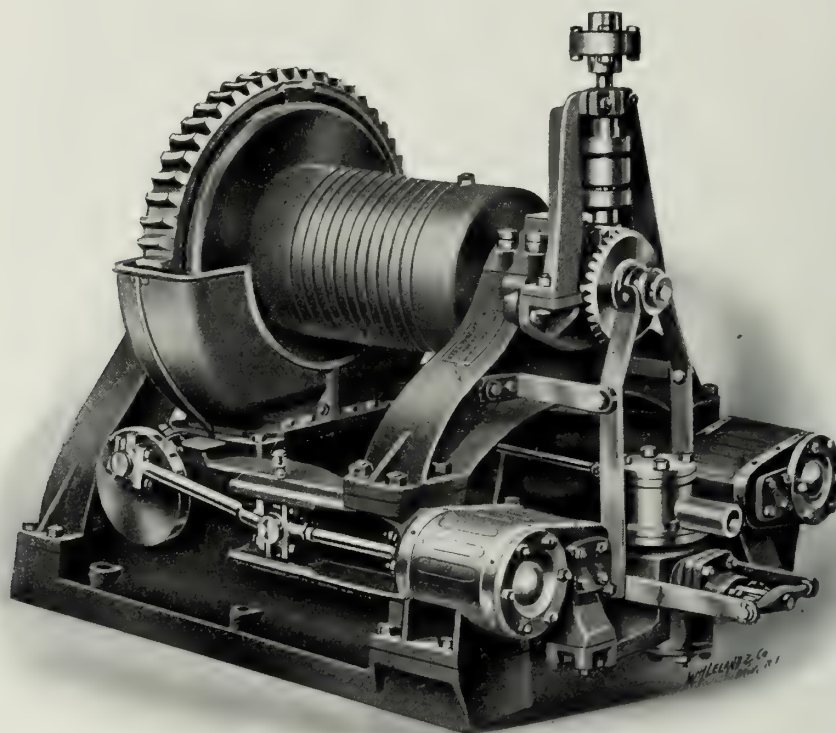
**HYDE WINDLASS COMPANY**

**Bath, Maine**

**No. 27**



## HYDE STEAM STEERER



FOR small steamships this engine is a standard type. It is very compact and on account of the small space occupied, can be located in almost any convenient position on board ship, the shaft from steering stand in pilot house connecting to the vertical shaft at steering engine. The drum of steering engine is grooved for chains or wire rope which can be led vertically up or directly down through the engine bed, connecting to the quadrant chains or ropes.

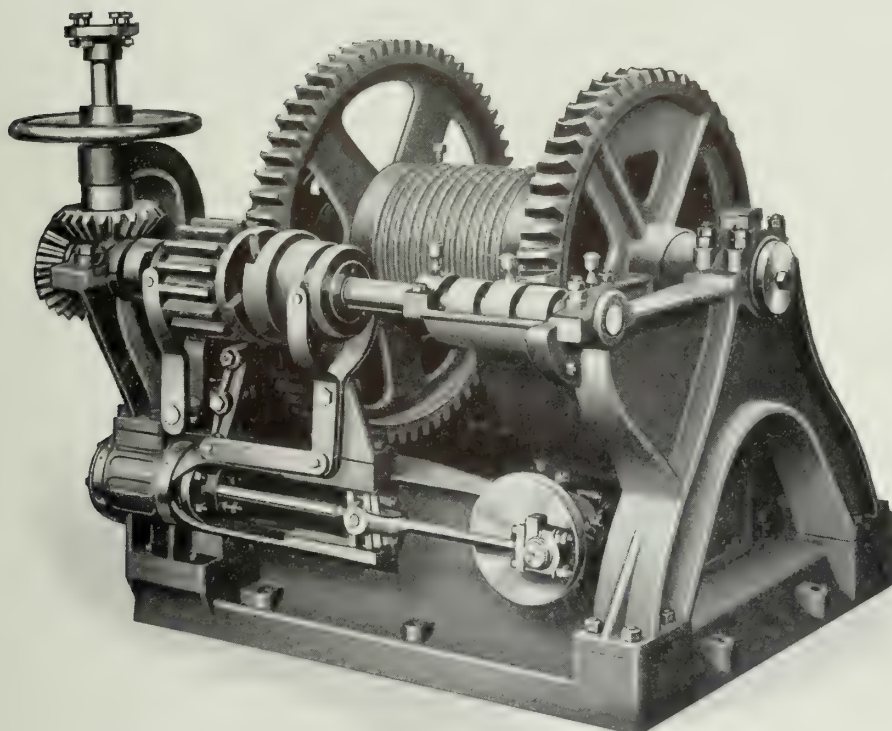
These engines are furnished in the following sizes:

$3\frac{1}{2}$ " diameter by  $3\frac{1}{2}$ " stroke.

4"	"	"	4"	"
$4\frac{1}{2}$ "	"	"	$4\frac{1}{2}$ "	"
5"	"	"	$5\frac{1}{2}$ "	"
6"	"	"	6"	"
6"	"	"	8"	"
7"	"	"	7"	"
8"	"	"	8"	"
9"	"	"	9"	"

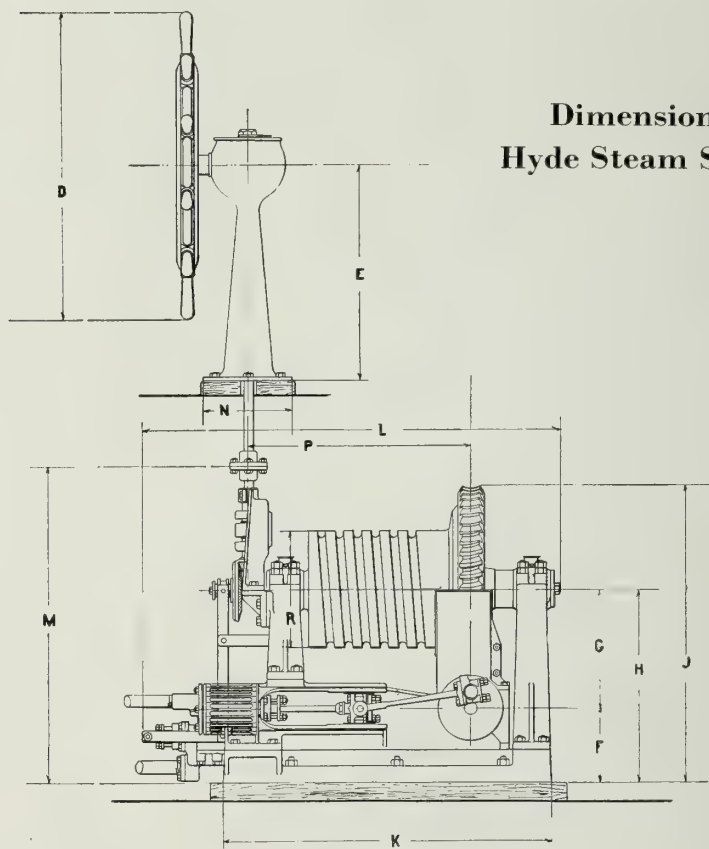
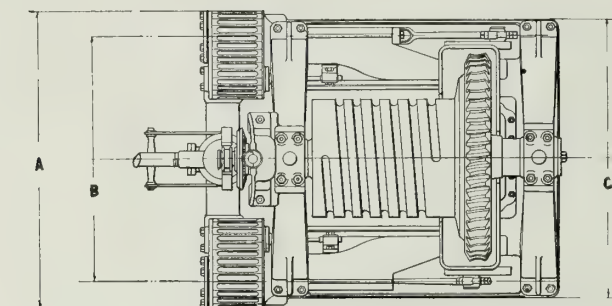
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## HYDE COMBINED STEAM AND HAND STEERER



**T**HIS is the same type of engine as shown on opposite page, with the exception that a pinion shaft is added, carrying clutch and pinion, the pinion being in mesh with a spur gear attached to engine drum. By this means a method is furnished for operating the drum of engine by hand through the steam steering wheel that controls the valve of steering engine when steering by steam. The change from one method of steering to the other can be made at the steering engine or from pilot house as preferred. Both these steering engines as well as all the steering engines made by this Company, are fitted with a patent check valve which automatically shuts off steam from the engine whenever the engine is at rest.

These engines are supplied in the same sizes as that on the opposite page.



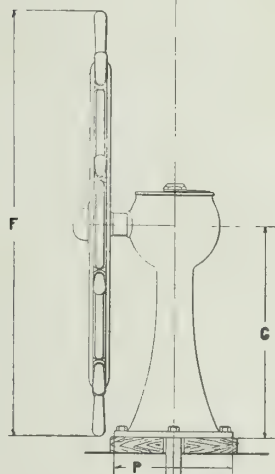
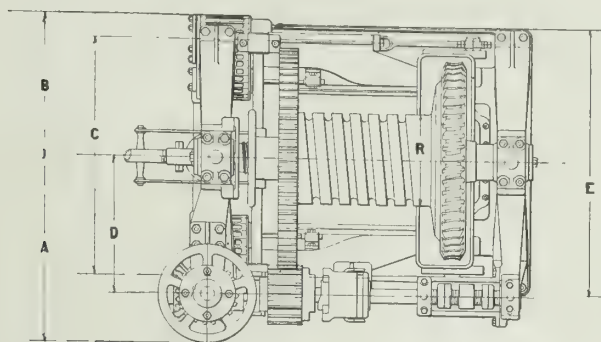
Dimensions of  
Hyde Steam Steerers

DIMENSIONS OF STEERING ENGINES  
WITH DRUM STEAM ONLY

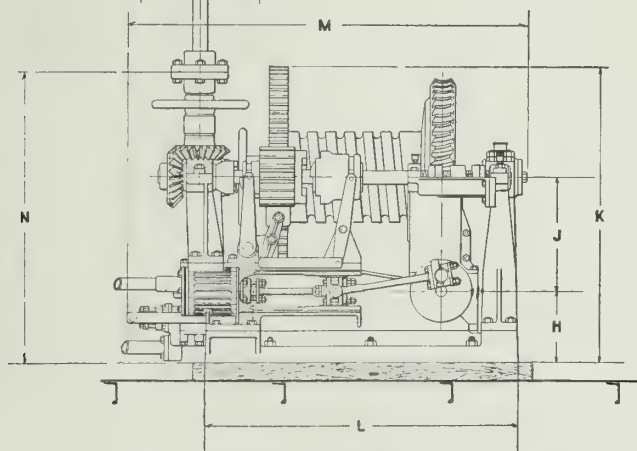
SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	STEAM	EXHAUST	R
3½-5½	30"	24½	27½	42"	29½	8"	10"	18"	27½	20½	42½	35"	12"	22½	1"	1½"	
5-6	34"	25"	27½	42"	29½	8"	10"	18"	27½	20½	42½	35"	12"	22½	1"	1½"	
4½-6½	41½	33½	38"	42"	29½	10"	16½	24½	40½	45"	50"	43½	12"	30½	1½"	1½"	
5-7	41½	33½	38"	42"	29½	10"	16½	24½	40½	45"	50"	43½	12"	30½	1½"	1½"	
6-6	51½	42"	49"	42"	30"	13"	19½	32½	50½	54½	72"	50½	17"	40½	1½"	2"	
6-8	51½	42"	49"	42"	30"	13"	19½	32½	50½	54½	72"	50½	17"	40½	1½"	2"	
7-7	58½	46"	55½	42"	30"	15"	19½	34½	50½	54½	75"	52½	17"	40"	2"	2½"	
8-8	58½	46"	55½	42"	30"	15"	19½	34½	50½	54½	75"	52½	17"	40"	2"	2½"	
9-9	62½	50"	62½	42"	30"	14½	25½	39½	62½	64½	84"	90"	17"	44½	2½"	3"	

DIMENSIONS OF DRUM TAIL  
CUM V. OR WIRE PIPE





**Dimensions of  
Hyde Steam and Hand  
Steerers**

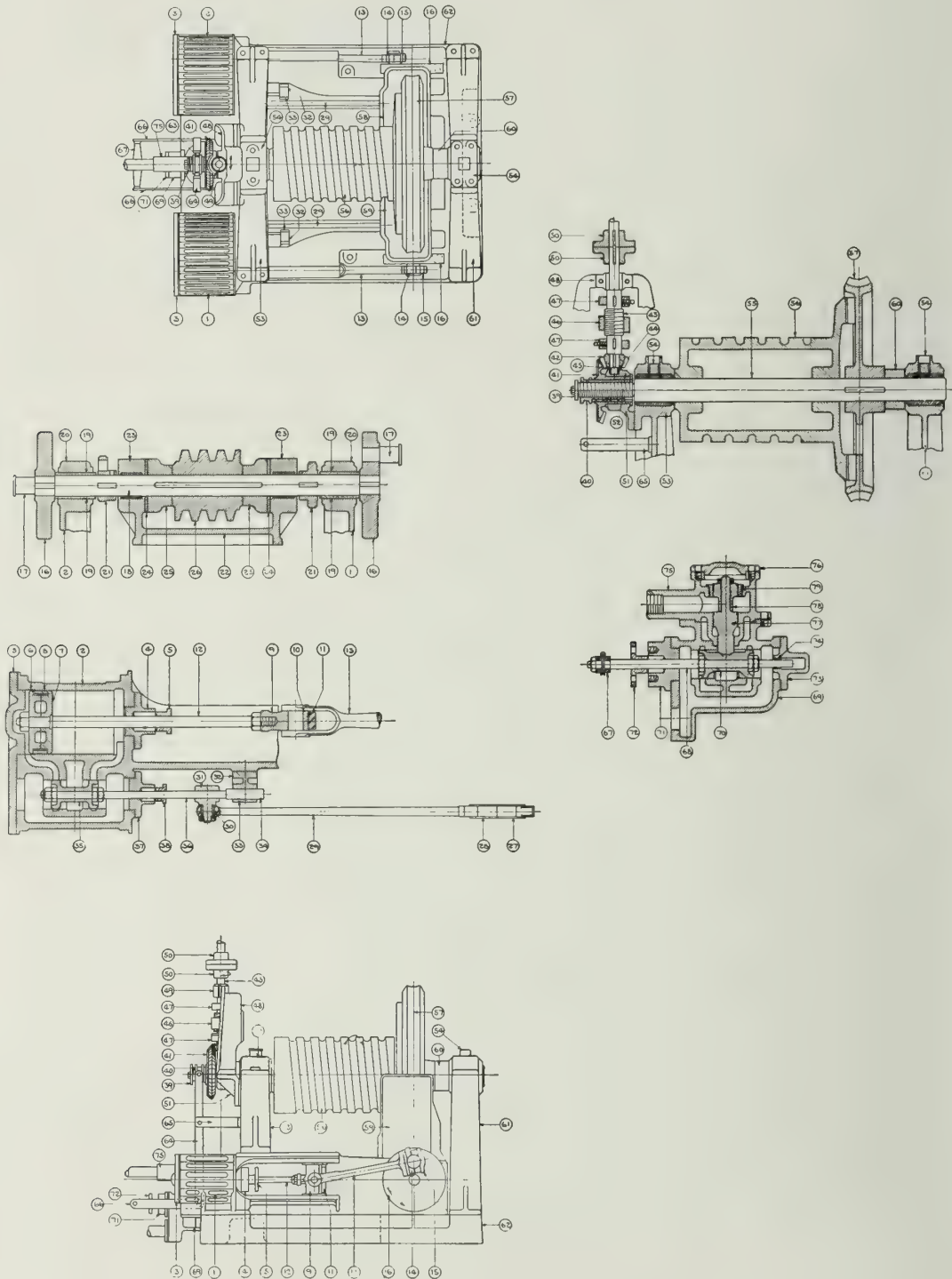


**DIMENSIONS OF STEERING ENGINES  
WITH DRUM STEAM AND HAND COMBINED**

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	STEAM	EXHAUST	R
4 x 6	19 1/2	16 1/2	26 1/2	14 1/2	20	10	10	5	3 1/2	4 1/2	4 1/2	4 1/2	17 1/2	1	1 1/2		
4 1/2 x 6 1/2	25 1/2	22 1/2	32 1/2	18 1/2	26 1/2	12 1/2	12 1/2	7 1/2	4 1/2	5 1/2	5 1/2	5 1/2	17 1/2	1 1/2	2 1/2		
5 x 6 1/2	29 1/2	26 1/2	36 1/2	22 1/2	30 1/2	14 1/2	14 1/2	10	5 1/2	6 1/2	6 1/2	6 1/2	17 1/2	2	3 1/2		
6 x 6	33 1/2	30 1/2	40 1/2	26 1/2	34 1/2	16 1/2	16 1/2	12 1/2	6 1/2	7 1/2	7 1/2	7 1/2	17 1/2	2 1/2	4 1/2		
6 x 8	37 1/2	34 1/2	44 1/2	30 1/2	38 1/2	18 1/2	18 1/2	14 1/2	7 1/2	8 1/2	8 1/2	8 1/2	17 1/2	3	5 1/2		
7 x 7	41 1/2	38 1/2	48 1/2	34 1/2	42 1/2	20 1/2	20 1/2	16 1/2	8 1/2	9 1/2	9 1/2	9 1/2	17 1/2	3 1/2	6 1/2		
8 x 6	45 1/2	42 1/2	52 1/2	38 1/2	46 1/2	22 1/2	22 1/2	18 1/2	9 1/2	10 1/2	10 1/2	10 1/2	17 1/2	4	7 1/2		
9 x 7	49 1/2	46 1/2	56 1/2	42 1/2	50 1/2	24 1/2	24 1/2	20 1/2	10 1/2	11 1/2	11 1/2	11 1/2	17 1/2	4 1/2	8 1/2		

STEAM AND HAND COMBINED  
DRAWING TO BE MADE HERE

# LIST OF PARTS FOR STEAM STEERER



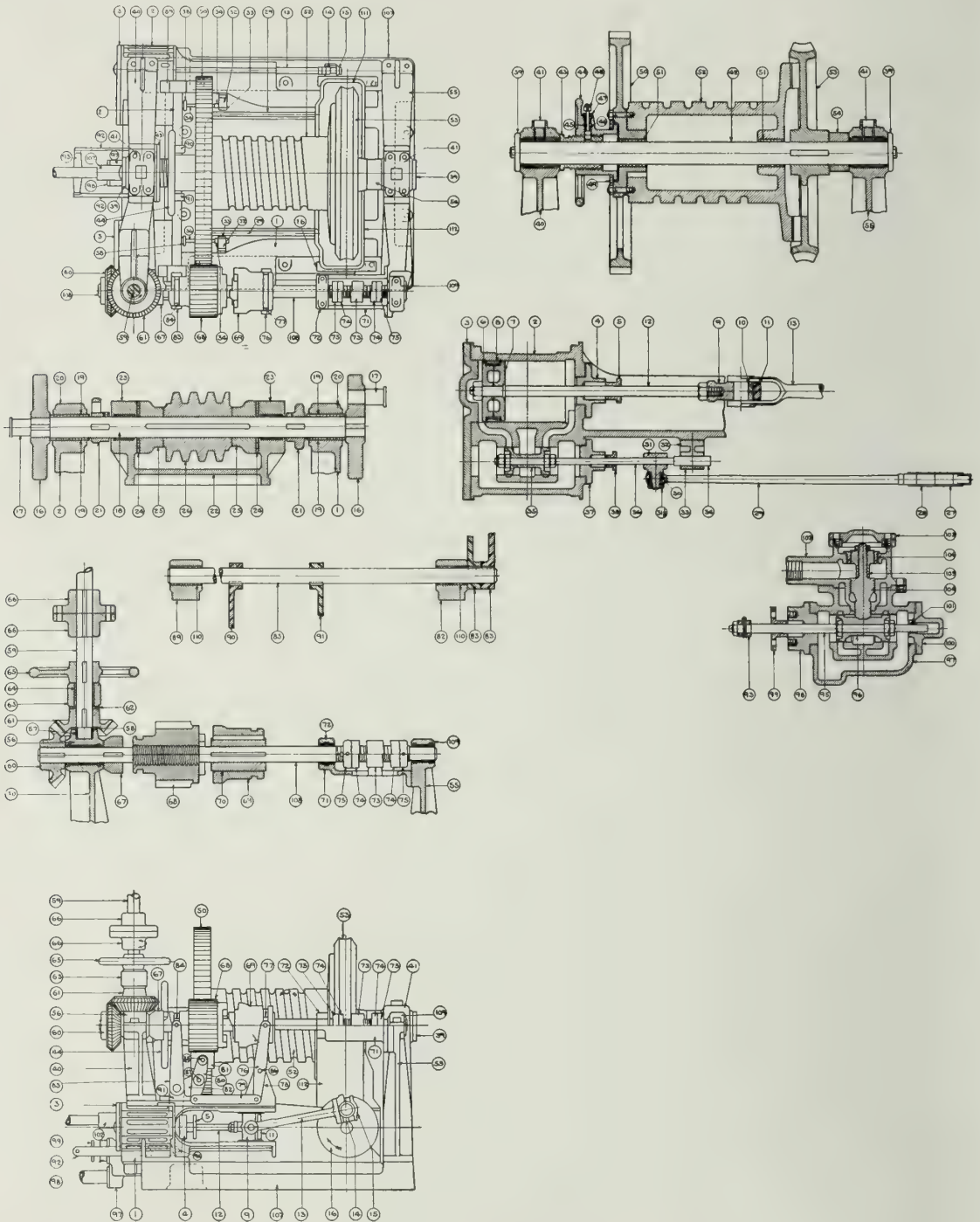
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## LIST OF PARTS FOR STEAM STEERER

1. Cylinder and Slides.
2. Cylinder and Slides.
3. Cylinder Cover.
4. Piston Rod Stuffing Box.
5. Piston Rod Stuffing Box Gland.
6. Half Piston.
7. Half Piston.
8. Piston Ring.
9. Crosshead.
10. Crosshead Box.
11. Crosshead Binder.
12. Piston Rod.
13. Connecting Rod.
14. Connecting Rod Box.
15. Connecting Rod Box.
16. Crank Disk.
17. Crank Pin.
18. Crank Shaft.
19. Crank Shaft Box.
20. Crank Shaft Cap.
21. Eccentric Sheave.
22. Thrust Bearing.
23. Thrust Bearing Cap.
24. Thrust Collar.
25. Worm Butt.
26. Worm.
27. Eccentric Strap.
28. Eccentric Strap.
29. Eccentric Rod.
30. Eccentric Rod Bushing.
31. Valve Stem Knuckle.
32. Valve Stem Guide.
33. Valve Stem Guide Cap.
34. Valve Stem Block.
35. Piston Valve.
36. Piston Valve Stem.
37. Piston Valve Stem Stuffing Box.
38. Piston Valve Stem Stuffing Box Gland.
39. Drum Shaft Collar.
40. Sleeve.
41. Bevel Gear.
42. Bevel Pinion.
43. Upright Shaft.
44. Upright Shaft Bushing.
45. Thrust Collar.
46. Floating Nut.
47. Floating Nut Stop.
48. Floating Nut Stand.
49. Floating Nut Stand Cap.
50. Flange Coupling.
51. Bevel Gear Bearing.
52. Bevel Gear Bearing Cap.
53. Small Bearing.
54. Drum Shaft Bearing Cap.
55. Drum Shaft.
56. Drum.
57. Engine Worm Gear.
58. Gear Casing.
59. Gear Casing.
60. Distance Collar.
61. Large Bearing.
62. Bed Plate.
63. Sleeve Swivel.
64. Controlling Lever.
65. Lever Bracket.
66. Control Valve Stem Link.
67. Control Valve Stem Yoke.
68. Control Valve Stem.
69. Control Valve Body.
70. Control Valve Piston Valve.
71. Control Valve Piston Valve Stuffing Box.
72. Control Valve Piston Valve Stuffing  
Box Gland.
73. Control Valve Cover and Guide.
74. Control Valve Stem Bushing.
75. Check Valve Body.
76. Check Valve Body Cover.
77. Lower Check Valve.
78. Upper Check Valve.
79. Upper Check Valve Seat.



# LIST OF PARTS FOR STEAM AND HAND STEERER



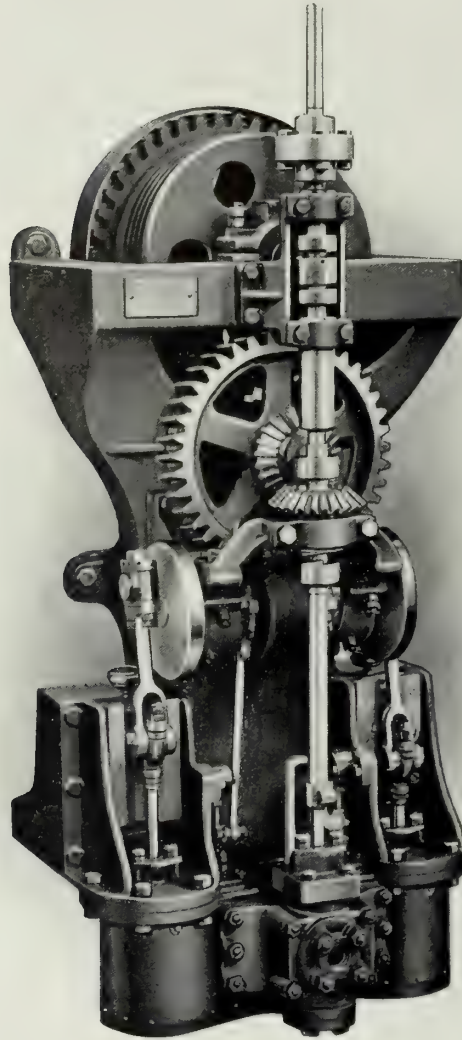
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## LIST OF PARTS FOR STEAM AND HAND STEERER

1. Cylinder and Slides.
2. Cylinder and Slides.
3. Cylinder Cover.
4. Piston Rod Stuffing Box.
5. Piston Rod Stuffing Box Gland.
6. Half Piston.
7. Half Piston.
8. Piston Ring.
9. Crosshead.
10. Crosshead Box.
11. Crosshead Binder.
12. Piston Rod.
13. Connecting Rod.
14. Connecting Rod Box.
15. Connecting Rod Box.
16. Crank Disk.
17. Crank Pin.
18. Crank Shaft.
19. Crank Shaft Box.
20. Crank Shaft Cap.
21. Eccentric Sheave.
22. Thrust Bearing.
23. Thrust Bearing Cap.
24. Thrust Collar.
25. Worm Butt.
26. Worm.
27. Eccentric Strap.
28. Eccentric Strap.
29. Eccentric Rod.
30. Eccentric Rod Bushing.
31. Valve Stem Knuckle.
- 31a. Valve Stem Knuckle Collar.
32. Valve Stem Guide.
33. Valve Stem Guide Cap.
34. Valve Stem Block.
35. Piston Valve.
36. Piston Valve Stem.
37. Piston Valve Stem Stuffing Box.
38. Piston Valve Stem Stuffing Box Gland.
39. Drum Shaft Collar.
40. Short Bearing.
41. Drum Shaft Cap.
42. Drum Shaft.
43. Screw Locking Yoke.
44. Locking Hand Wheel.
45. Stop Pin.
46. Stop Pin Spring.
47. Stop Pin Hole Plug.
48. Stop Pin Handle.
49. Half Collar.
50. Spur Gear.
51. Gear and Drum Bushing.
52. Drum.
53. Engine Worm Gear.
54. Drum Shaft Collar.
55. Large Bearing.
56. Countershaft Cap.
57. Upright Shaft Bushing.
58. Upright Shaft Collar.
59. Upright Shaft.
60. Mitre Gear.
61. Mitre Gear.
62. Collar.
63. Spring Bearing.
64. Spring Bearing Bushing.
65. Handwheel.
66. Flange Coupling.
67. Collar with Stop.
68. Spur Pinion.
69. Clutch.
70. Clutch Sleeve.
71. Floating Nut Guide.
72. Floating Nut Guide Cap.
73. Floating Nut.
74. Floating Nut Stop.
75. Adjusting Collar.
76. Clutch Lever.
77. Clutch Swivel.
78. Clutch Lever Bearing.
79. Side Link.
80. Shifting Lever.
81. Shipper.
82. Control Shaft Bearing.
83. Swivel Lever.
84. Pinion Swivel.
85. Control Shaft.
86. Clutch Lever Bolt.
87. Shifting Lever Bolt.
88. Shipper Spindle.
89. Control Shaft Bearing.
90. Control Valve Stem Lever.
91. Control Valve Stem Lever.
92. Control Valve Stem Link.
93. Control Valve Stem Yoke.
94. Lever Bolt.
95. Control Valve Stem.
96. Control Piston Valve.
97. Control Valve Body.
98. Control Valve Stuffing Box.
99. Control Valve Stuffing Box Gland.
100. Control Valve Cover and Guide.
101. Control Valve Stem Bushing.
102. Check Valve Body.
103. Check Valve Body Cover.
104. Lower Check Valve.
105. Upper Check Valve.
106. Upper Check Valve Seat.
107. Bed Plate.
108. Countershaft.
109. Countershaft Cap.
110. Control Shaft Bushing.
111. Half Gear Casing.
112. Half Gear Casing.

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## HYDE STEAM STEERING ENGINE



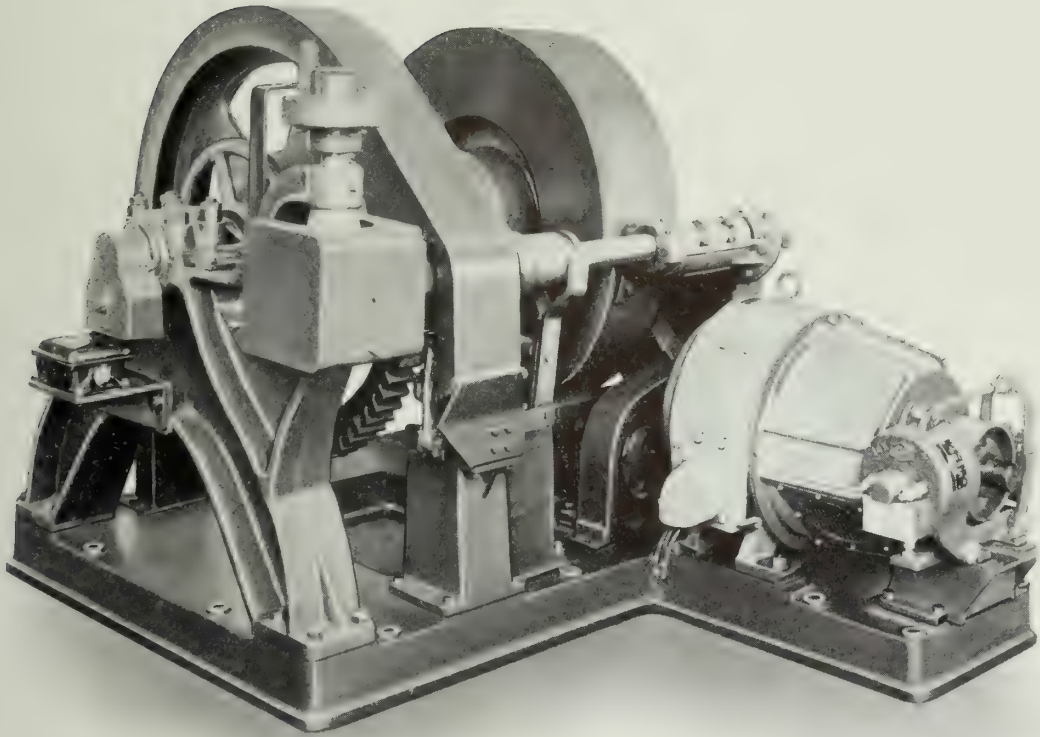
THE engine shown in cut is designed for bolting to a vertical bulkhead in the main engine room; the drum being on top makes a very convenient lead of the wire ropes to each side for connecting to quadrant ropes or chains. This engine was designed partly for installing on steam yachts where it is desirable for all the machinery to be located in one compartment if possible. The vertical shaft on the engine extends to the steering stand located in the pilot house.



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## HYDE ELECTRIC DRUM STEERER

### With Hand Steering

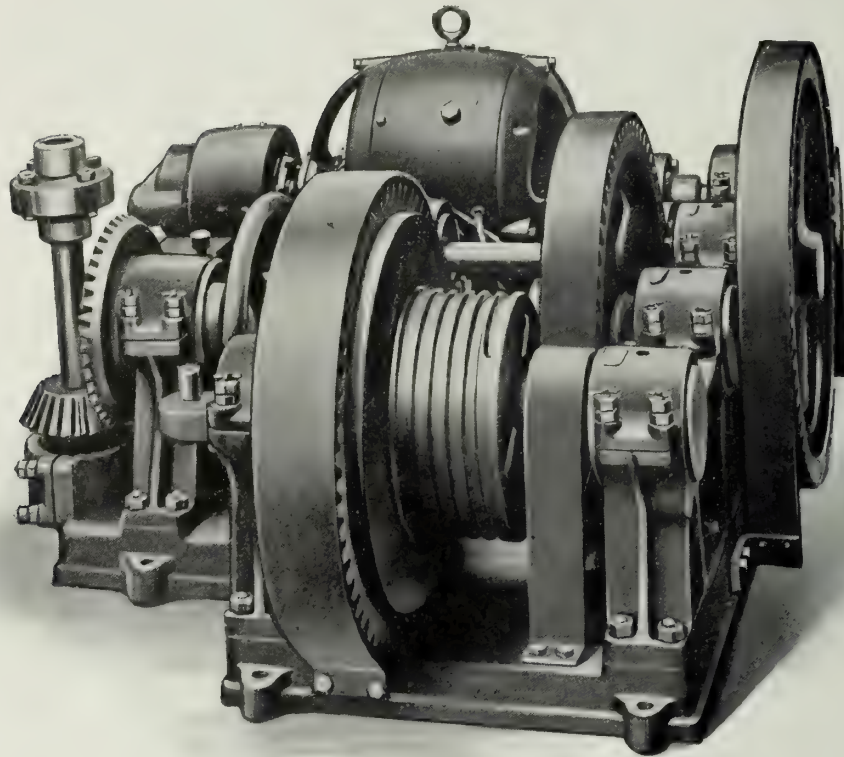


THE electric steerer as illustrated is a combined electrically driven and hand operated steerer. Marine motor and brake are water-tight or drip-proof. Electric non-follow-up control is recommended. The steerer is generally located aft and fitted with drum grooved for chain or wire rope which connects to the quadrant on the rudder stock. The hand wheel at the end of the drum shaft provides a quick means for disconnecting the drum from the worm gear when hand steering is to be used. Steering gear of this type can be furnished in any size to meet requirements.

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## HYDE ELECTRIC DRUM STEERER

### Spur Geared Type



THIS steerer was designed to meet the requirements of a light and efficient steering gear and at the same time is capable of exerting a powerful pull on the quadrant, wire ropes or chains. Marine motor and brake are water-tight or drip-proof. Electric non-follow-up control is recommended. This type of steering gear can be furnished in any size, whether electric or combined electric and hand steerer.

# **HYDE**

## **STEAM AND ELECTRIC CAPSTANS AND GYPSYS**



**HYDE WINDLASS COMPANY**

**Bath, Maine**

**No. 28**



## THE "HYDE" POWER CAPSTAN

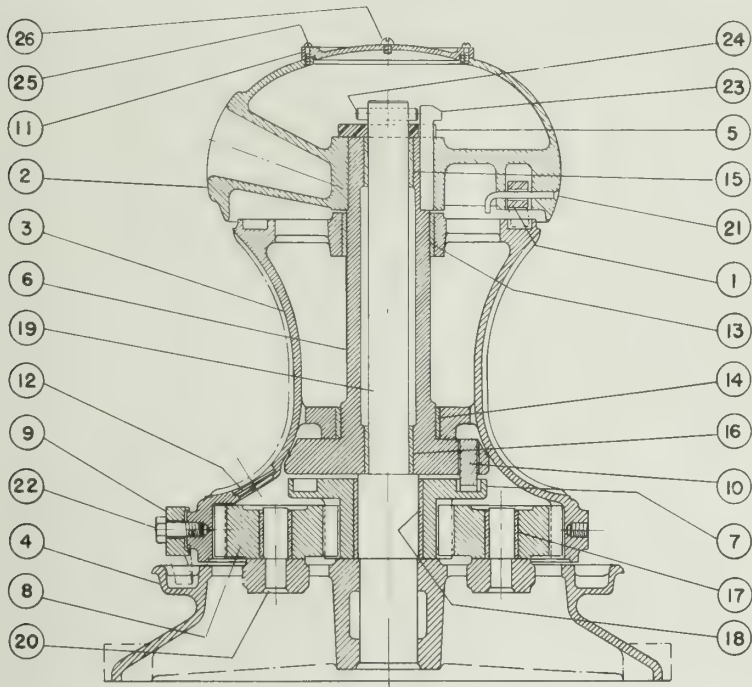


THESE capstans are in very general use and challenge comparison with any made. The gears are in the lower part of barrel where there is room to make them of ample strength. The strain is taken by the inside pawls as well as by those on the outside, and as the inside pawls are sufficiently strong to hold the load even if the outer ones were left off entirely, the danger as well as the annoyance of "jumping" is avoided. It is only necessary to turn the head in the opposite direction for power after the slack is all taken in, the barrel always turning in the same direction.

All bearings are of composition, and all parts are interchangeable and can be duplicated at any time.

No.	Diameter Barrel Inches	Diameter Base Inches	Height Inches	Weight Pounds
1	15	36	44	1600
2	13	34	42	1300
3	11	32	40	1050
4	10	30	34½	725
5	9	29	32	560
6	8½	26	29	475
7	8¼	24	27	375

## LIST OF PARTS FOR POWER CAPSTAN



NO. OF PART	NAME OF PART
1	HEAD PAWL
2	HEAD
3	BODY
4	BASE
5	COLLAR
6	SLEEVE
7	CENTER GEAR
8	PINION
9	BODY PAWL
10	DROP PAWL
11	COVER
12	SPECIAL PLUG ( FOR OILING PINIONS)
13	BUSHING (UPPER BODY)

NO. OF PART	NAME OF PART
14	BUSHING ( LOWER BODY)
15	BUSHING (SLEEVE UPPER)
16	BUSHING (SLEEVE LOWER)
17	BUSHING (PINION)
18	BUSHING (CENTER GEAR)
19	CAPSTAN SHAFT
20	PINION PINS
21	HEAD PAWL PIN
22	BODY PAWL BOLT
23	SPECIAL KEY
24	SHAFT PIN
25	ROUND HEAD COVER SCREW
26	ROUND HEAD SCREW FOR OILING PURPOSES

## THE "HYDE" CRANK CAPSTAN

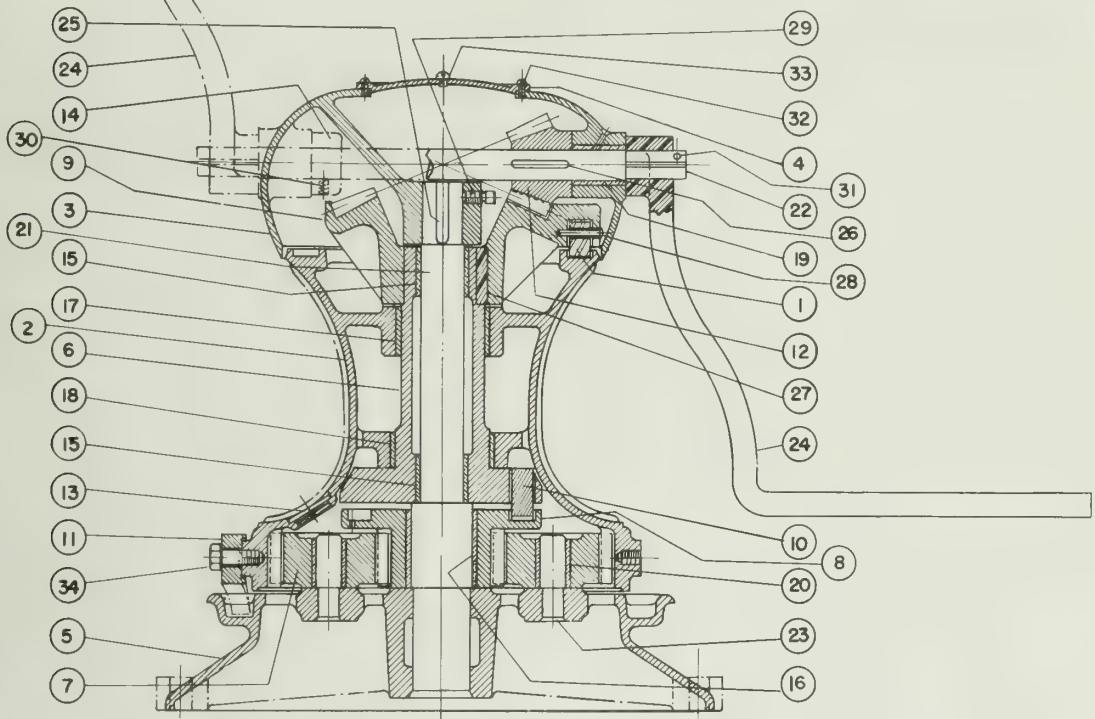


THE capstan here shown is especially useful where the deck room is limited and not space enough to work the ordinary power capstan, and like that capstan can be driven either for speed or power without change of parts, etc., it being only necessary to turn the cranks in one direction for speed and in the opposite direction for power, the barrel always turning in the same direction. When not in use the cranks can be taken off and stowed away, thus leaving the space clear around the capstan as in the case of the power capstan when not in use.

No.	Diameter Barrel Inches	Diameter Base Inches	Height Inches	Weight Pounds
1	15			
2	13	39	44	1600
3	11	33	41	1200
4	10	29	39	938
5	9	29	35	750
6	8 $\frac{1}{2}$	26	30	570
7	8 $\frac{1}{4}$	24	28	500



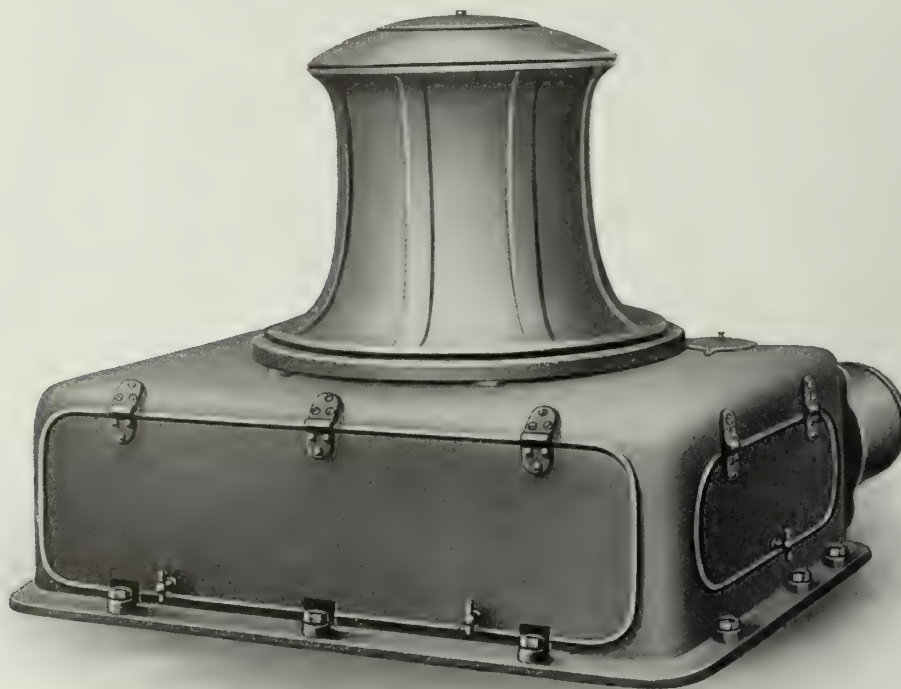
## LIST OF PARTS FOR CRANK CAPSTAN



NO.OF PART	NAME OF PART
1	HEAD PAWL
2	CAPSTAN BODY
3	CAPSTAN HEAD
4	CAPSTAN HEAD COVER
5	CAPSTAN BASE
6	SLEEVE
7	PINION (SPUR)
8	CENTER GEAR
9	BEVEL GEAR
10	SLEEVE DROP PAWL
11	BODY PAWL
12	BEVEL PINION
13	SPECIAL PLUG (FOR OILING PURPOSES)
14	CRANK SHAFT COLLAR
15	BUSHING (SLEEVE)
16	BUSHING (CENTER GEAR)
17	BUSHING (UPPER BODY)

NO.OF PART	NAME OF PART
18	BUSHING (LOWER BODY)
19	BUSHING (HEAD CRANK SHAFT)
20	BUSHING (PINION)
21	CAPSTAN SHAFT
22	CRANK SHAFT
23	PINION PIN
24	CRANK
25	KEY (HEAD)
26	KEY (BEVEL PINION)
27	KEY (BEVEL GEAR)
28	HEAD PAWL PIN
29	SET SCREW (HEAD)
30	SET SCREW (CRANK SHAFT COLLAR)
31	CRANK SHAFT PIN
32	ROUND HEAD COVER SCREW
33	ROUND HEAD SCREW (FOR OILING PURPOSES)
34	BODY PAWL BOLT

## THE "HYDE" STEAM GYPSY



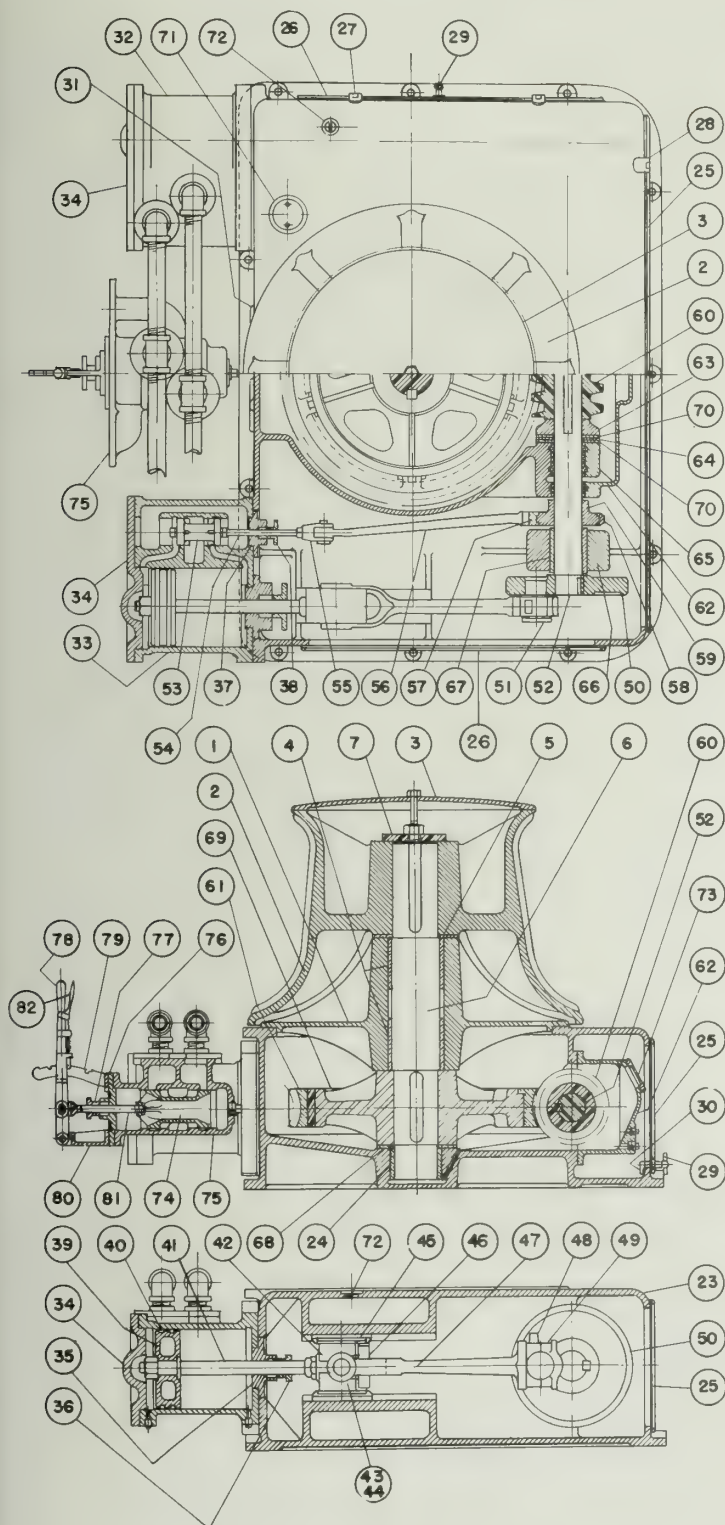
ENGINES ENCLOSED IN BASE

**T**HIS steam gypsy is a favorite type for locating on vessels where the space under deck cannot be used for installing a steam engine. In this type the engine is entirely enclosed in the base under the gypsy. It is installed on many large steamships, and to a great extent on tugboats where used for general warping purposes. We furnish this steam gypsy of the same size engines as are used on the steam capstan, as follows:

DIMENSIONS OF STEAM GYPSYS (DOCK TYPE)

Diam. Gypsy	Engine	Height	Width Eng. Bed	Length Eng. Bed	Length Overall	Weight	Size Rope
15"	4½" x 6"	2'-10"	4'-3"	3'-4"	4'-2"	2900	5"
15"	6" x 6"	2'-10"	4'-3"	3'-4"	4'-2"	3200	5"
20"	5" x 8"	3'-1"	4'-5"	3'-6"	4'-7"	4000	6"
20"	6" x 8"	3'-1"	4'-5"	3'-6"	4'-7"	4250	6"
22"	7" x 8"	3'-8"	4'-12"	3'-11"	6'-1"	5200	7"
22"	8" x 8"	3'-8"	4'-12"	3'-11"	6'-1"	5600	7"
24"	9" x 9"	4'-9"	5'-5"	4'-5"	5'-6"	7000	8"
24"	10" x 10"	4'-10"	6'-1"	4'-6"	6'-10"	9000	8"

# LIST OF PARTS FOR STEAM DOCK GYPSY OR CAPSTAN



NO. OF PART	NAME OF PART
1	GYPSY BASE
2	GYPSY HEAD
3	GYPSY HEAD COVER
4	GYPSY BASE BUSHING
5	GYPSY THRUST COLLAR
6	GYPSY SHAFT
7	GYPSY SHAFT CAP
23	ENGINE PAN
24	ENGINE PAN BUSHING
25	LARGE DOOR
26	SMALL DOOR
27	FLAT HINGE
28	CURVED HINGE
29	DOOR HANDLE
30	DOOR CATCH
31	HANDHOLE COVER
32	CYLINDER (RIGHT)
33	CYLINDER (LEFT)
34	CYLINDER COVER
35	PISTON ROD STUFFING BOX
36	PISTON ROD STUFFING BOX GLAND
37	VALVE STEM STUFFING BOX
38	VALVE STEM STUFFING BOX GLAND
39	PISTON
40	PISTON RING
41	PISTON ROD
42	CROSSHEAD
43	CROSSHEAD HALF BOX
44	CROSSHEAD HALF BOX
45	CROSSHEAD GIBBS
46	CROSSHEAD BINDER
47	CONNECTING ROD
48	CONNECTING ROD BOX WITH OIL BOX
49	CONNECTING ROD BOX WITHOUT OIL BOX
50	CRANK DISK
51	CRANK PIN
52	CRANK SHAFT
53	PISTON VALVE
54	VALVE STEM
55	VALVE STEM KNUCKLE
56	ECCENTRIC ROD
57	ECCENTRIC STRAP (INNER)
58	ECCENTRIC STRAP (OUTER)
59	ECCENTRIC SHAFT
60	WORM
61	WORM GEAR RIM
62	WORM CASING
63	WORM BUTT
64	THRUST COLLAR (CAST IRON)
65	THRUST BEARING CAP
66	CRANK SHAFT BEARING CAP
67	CRANK SHAFT BEARING BOX (HALF)
68	WORM GEAR THRUST COLLAR
69	WORM GEAR CENTER
70	THRUST COLLAR (COMPOSITION)
71	SPECIAL PLUG
72	SPECIAL PLUG
73	HANDHOLE COVER
74	REVERSE VALVE
75	REVERSE VALVE BODY
76	REVERSE VALVE COVER AND STUFFING BOX
77	REVERSE VALVE STUFFING BOX GLAND
78	REVERSE VALVE LEVER
79	REVERSE VALVE QUADRANT
80	REVERSE VALVE LEVER BRACKET
81	REVERSE VALVE STEM
82	REVERSE VALVE LEVER LATCH

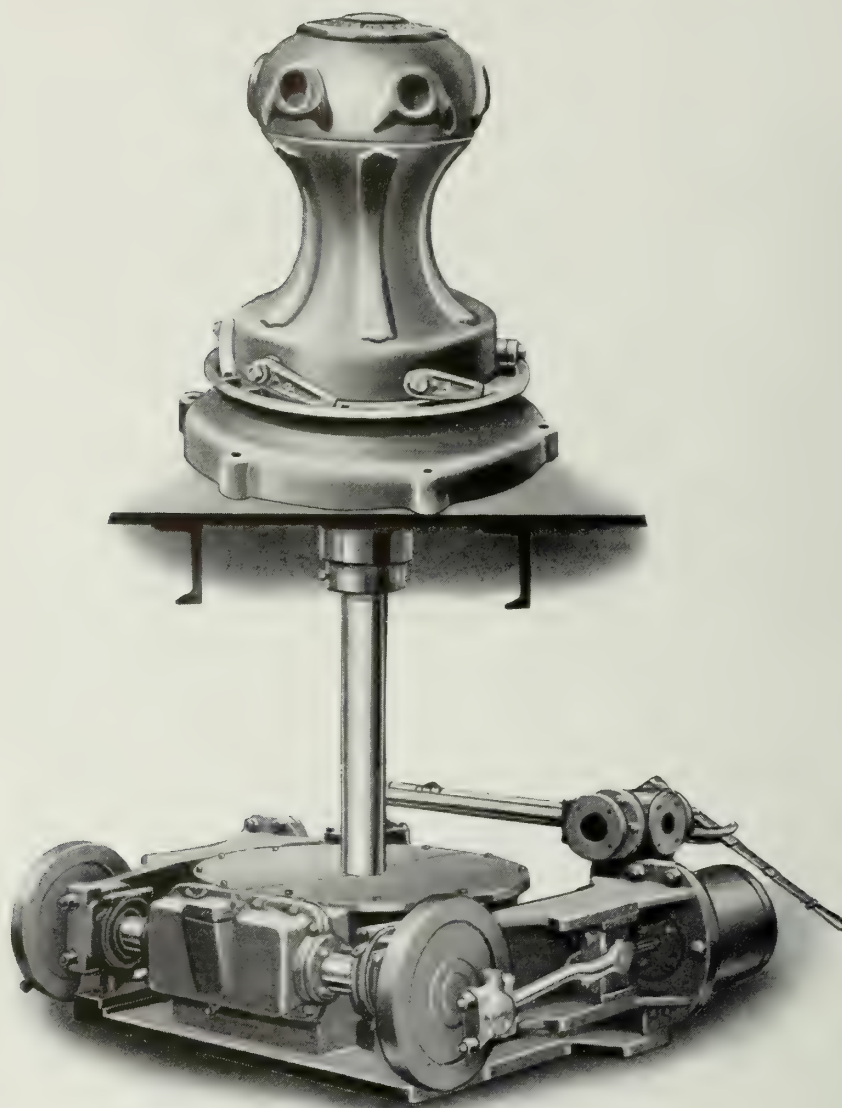
## — NOTE —

THIS MACHINE IS FURNISHED WITH GYPSY HEAD OR CAPSTAN HEAD — THE ABOVE LIST IS COMPLETE FOR DOCK GYPSY.

IF CAPSTAN HEAD IS FURNISHED SEE PAGE NO. 9. FOR PART NUMBERS 1 TO 22 INCLUSIVE, ALL OTHER PARTS ARE COMMON TO BOTH.



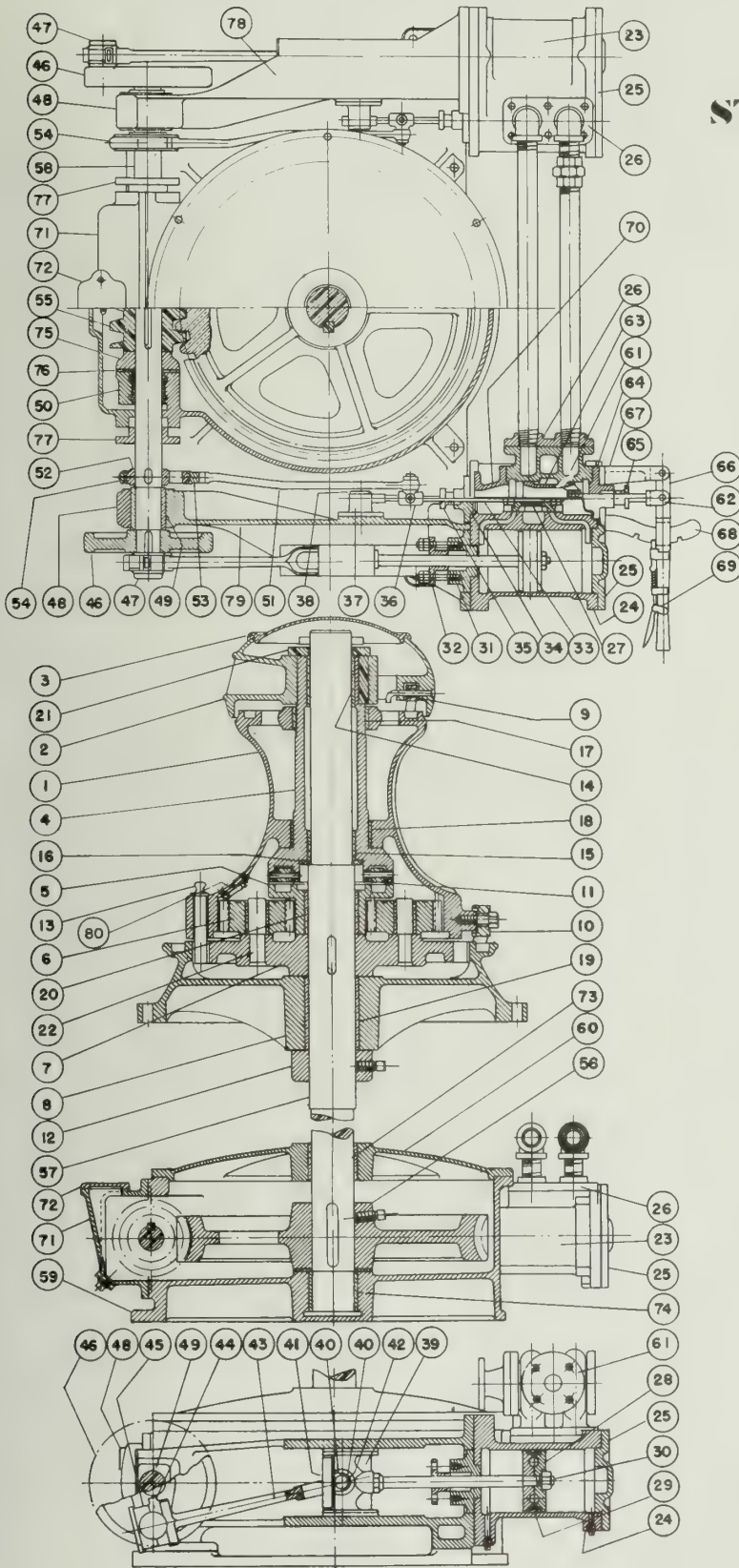
## THE "HYDE" STEAM CAPSTAN



DIMENSIONS OF STEAM CAPSTANS

Size	Engine	Diam. Barrel	Diam. Base	Height	Length	Width	Weight
5	4 $\frac{1}{2}$ " x 6"	9"	29"	32"	3'-5"	3'-10"	3200
5	6" x 6"	9"	29"	32"	3'-5"	4'-3"	3425
4	5" x 8"	10"	30"	34 $\frac{1}{2}$ "	4'-2"	5'-2"	4100
3	6" x 8"	11"	32"	40"	4'-2"	5'-2"	4300
3	7" x 8"	11"	32"	40"	4'-10"	5'-11"	5350
2	8" x 8"	13"	34"	42"	4'-10"	5'-11"	5700

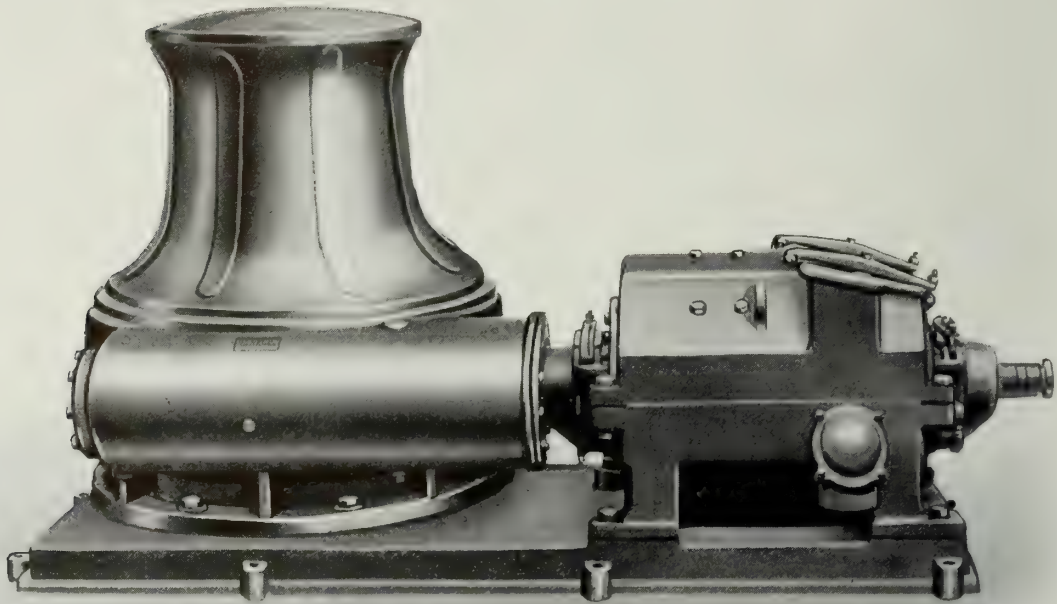
# **LIST OF PARTS FOR STEAM CAPSTAN OR GYPSY**



NOOF PART	NAME OF PART
1	CAPSTAN BODY
2	CAPSTAN HEAD
3	CAPSTAN COVER
4	CAPSTAN SLEEVE
5	CAPSTAN CENTER GEAR
6	CAPSTAN PINIONS
7	CAPSTAN PINION CARRIER
8	CAPSTAN BASE
9	CAPSTAN HEAD PAWL
10	CAPSTAN OUTSIDE BODY PAWL
11	CAPSTAN SLEEVE PAWL
12	CAPSTAN COLLAR
13	CAPSTAN LOCKING PIN
14	CAPSTAN SLEEVE BUSHING (TOP)
15	CAPSTAN SLEEVE BUSHING (BOTTOM)
16	CAPSTAN SLEEVE THRUST COLLAR
17	CAPSTAN BODY BUSHING (TOP)
18	CAPSTAN BODY BUSHING (BOTTOM)
19	CAPSTAN BASE BUSHING
20	CAPSTAN CENTER GEAR BUSHING
21	CAPSTAN SHAFT TOP COLLAR
22	CAPSTAN PINION PIN
23	CYLINDER (RIGHT)
24	CYLINDER (LEFT)
25	CYLINDER COVER
26	PIPE FLANGE
27	PISTON VALVE
28	PISTON (HALF)
29	PISTON RING
30	PISTON ROD
31	PISTON ROD STUFFING BOX
32	PISTON ROD STUFFING BOX GLAND
33	VALVE STEM
34	VALVE STEM STUFFING BOX
35	VALVE STEM STUFFING BOX GLAND
36	VALVE STEM KNUCKLE
37	VALVE STEM GUIDE
38	VALVE STEM GUIDE CAP
39	CROSSHEAD
40	CROSSHEAD BOX
41	CROSSHEAD BINDER
42	CROSSHEAD PIN
43	CONNECTING ROD
44	CONNECTING ROD BOX (WITH OIL CUP)
45	CONNECTING ROD BOX (WITHOUT OIL CUP)
46	CRANK DISK
47	CRANK PIN
48	CRANK SHAFT BEARING CAP
49	CRANK SHAFT BEARING BOXES
50	THRUST BEARING CAP
51	ECCENTRIC ROD
52	ECCENTRIC SHEAVE
53	ECCENTRIC STRAP (INNER)
54	ECCENTRIC STRAP (OUTER)
55	ENGINE WORM
56	ENGINE WORM GEAR
57	MAIN SHAFT
58	CRANK SHAFT
59	WORM GEAR CASING
60	WORM GEAR CASING COVER
61	REVERSE VALVE
62	REVERSE VALVE VALVE STEM
63	REVERSE VALVE PISTON VALVE
64	REVERSE VALVE HEAD AND STUFFING BOX
65	REVERSE VALVE STUFFING BOX GLAND
66	REVERSE VALVE LEVER
67	REVERSE VALVE LEVER BRACKET
68	REVERSE VALVE LEVER QUADRANT
69	REVERSE VALVE LEVER GRIP
70	REVERSE VALVE REDUCING FITTING
71	WORM CASING
72	WORM CASING INSPECTION HOLE COVER
73	WORM GEAR CASING COVER BUSHING
74	WORM GEAR CASING BUSHING
75	WORM BUTT
76	WORM THRUST COLLAR
77	WORM CASING PACKING GLAND
78	ENGINE FRAME (RIGHT)
79	ENGINE FRAME (LEFT)
80	SPECIAL PLUG (FOR OILING PURPOSES)

**— NOTE —**  
**THIS MACHINE IS FURNISHED  
 WITH CAPSTAN HEAD OR  
 GYPSY HEAD - THE ABOVE  
 LIST IS COMPLETE FOR THE  
 CAPSTAN.**  
**IF GYPSY HEAD IS  
 FURNISHED SEE PART NO'S. 1  
 TO 7 INCLUSIVE ON PAGE 7.**  
**ALL PART NO'S. FROM 23 TO  
 79 INCLUSIVE ARE COMMON  
 TO BOTH.**

## THE "HYDE" ELECTRIC GYPSY



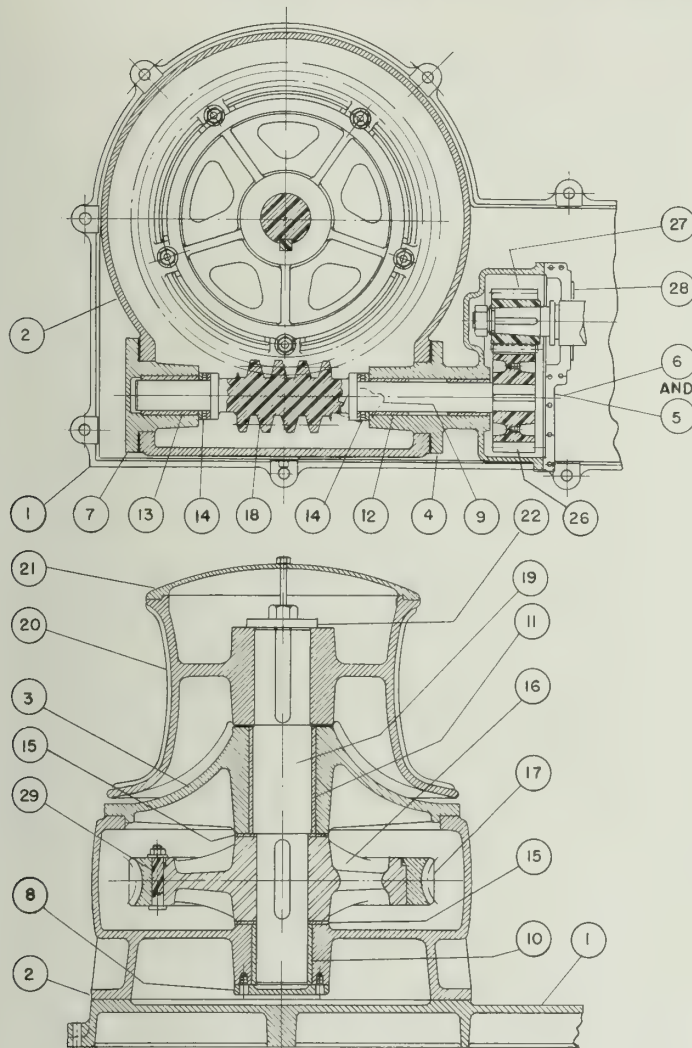
DIMENSIONS OF ELECTRIC GYPSYS

Horse Power	Diam. Gypsy	Length	Width	Height	CAPACITY		Weight with Motor	Size Rope	Breaking Strength Rope
					Pounds	Speed			
7½	11"	4' 6"	25"	2'-2½"	3000	40'	1725	4"	15000
10	13¾"	4'-6"	25"	2'-6"	4100	40'	1900	4½"	18500
15	15"	5'-8"	2'-9"	3'-0"	6000	40'	1950	5"	22500
20	15"	5'-8"	2'-9"	3'-0"	8200	40'	2400	5"	22500
25	18"	7'-1"	3'-3"	3'-5"	10000	40'	4755	6"	31000
35	20"	7'-2"	3'-9¼"	3'-8"	15000	40'	5600	7"	41000
50	22"	8'-8"	4'-0"	4'-6"	22000	40'	8420	7"	41000
75	24"	9'-6"	4'-8"	4'-6"	31250	40'	13600	8"	52000

These Electric Gypsies can be furnished with more pull capacity on the Gypsy and a reduction in speed for taking in rope. Motor can be furnished with or without magnetic brake as may be necessary.

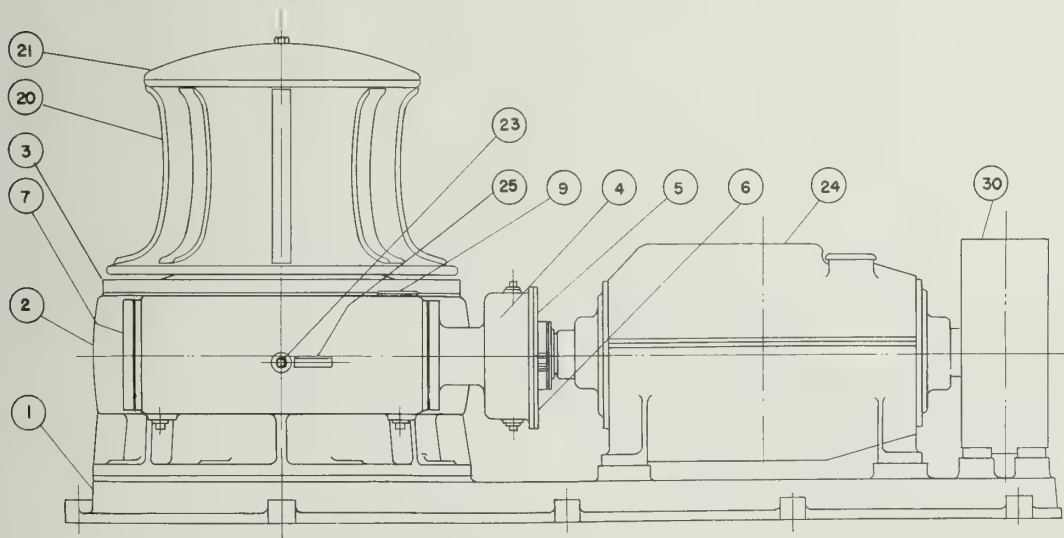


# PARTS LIST FOR ELECTRIC GYPSY



NO OF PART	NAME OF PART
1	BED PLATE
2	WORM GEAR CASING
3	GYPSY BASE
4	SPUR GEAR CASING
5	SPUR GEAR CASING COVER (TOP)
6	SPUR GEAR CASING COVER (BOTTOM)
7	WORM SHAFT BEARING
8	SHAFT COVER
9	OIL HOLE COVER
10	WORM GEAR CASING BUSHING
11	GYPSY BASE BUSHING
12	WORM CASING BUSHING
13	WORM SHAFT BEARING BUSHING
14	WORM SHAFT THRUST BEARINGS
15	GYPSY SHAFT THRUST COLLAR
16	WORM GEAR CENTER
17	WORM GEAR RIM
18	WORM SHAFT
19	GYPSY SHAFT
20	GYPSY HEAD
21	GYPSY HEAD COVER
22	GYPSY SHAFT CAP
23	SPECIAL PLUG
24	ELECTRIC MOTOR
25	OIL LEVEL PLATE
26	SPUR GEAR
27	SPUR PINION
28	FELT RETAINER
29	WORM GEAR R/M & CENTER KEYS
30	ELECTRIC BRAKE

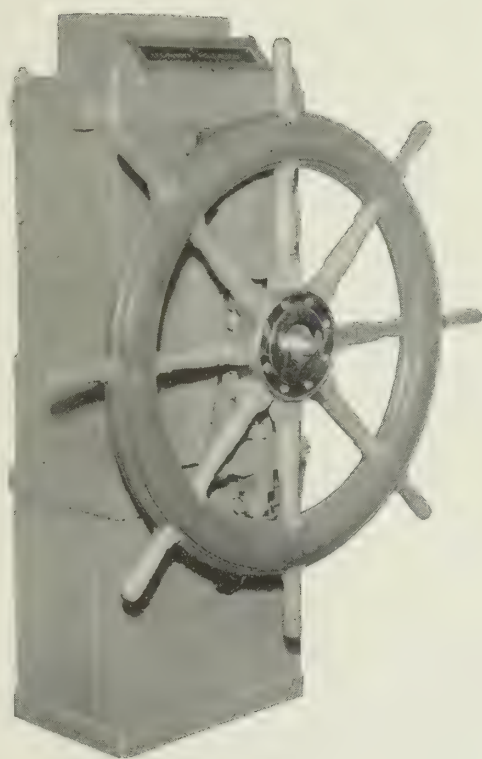
—NOTE—  
THIS MACHINE IS FURNISHED  
WITH OR WITHOUT BRAKE.





# **HYDE**

## **HYDRAULIC TELEMOTOR**



**HYDE WINDLASS COMPANY**

**BATH, MAINE**

**No. 29**



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## HYDE HYDRAULIC TELEMOTOR

**T**HE Hyde Hydraulic Telemotor is a means of controlling the steering gear, which is located near the stern of the vessel, by a helm in the pilot house. The Telemotor consists of a Forward Telemotor in the pilot house connected by tubing to the After Telemotor in the steering gear compartment.

The Forward Telemotor consists of a double plunger pump operated by the steering wheel. The pump cylinders are located side by side in the lower part of the telemotor in a vertical position. In each cylinder there is a plunger with a toothed rack attached to the upper end. The racks are in mesh with a pinion which is rotated through spur gearing by the steering wheel.

The Forward Telemotor casing is in three sections securely bolted together. The lower section is the support for the upper sections and has space for the plunger cylinders and miscellaneous valves and piping. The middle section supports the cylinders, gearing and shafts, and also acts as an oil expansion and replenishing reservoir. An oil level sight gage is provided to indicate the oil level in the tank. The upper section acts as a top cover and contains the helm angle indicator.

An automatic bypass valve is mounted on the Forward Telemotor which allows the oil pressure in the entire system to be equalized each time the steering wheel is placed in or passes through the amidships position. When the steering wheel is amidships, a cam depresses the stem of the automatic bypass valve, opening the valve. When the valve is open the two cylinders in the Forward Telemotor are cross connected, allowing an equalization of pressure to take place.

In addition to the automatic bypass valve a hand operated bypass valve is also provided. When this valve is open the two cylinders in the Forward



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Telemotor are cross connected. With the bypass valve open the After Telemotor cylinders may be moved without a corresponding movement of the Forward Telemotor.

On ships which have an electric steering control in addition to the Hydraulic Telemotor for steering control, an interlock switch is mounted so that it is operated by the manual bypass valve hand wheel. In order for power to be available to the electric steering control, this interlock switch must be closed. When this arrangement is used, the valve must be opened in order to close the interlock switch. In this manner the Hydraulic Telemotor will be in a bypass condition when electric power is available to the electric steering control.

Two replenishing and relief valves are also mounted in the Forward Telemotor, one connected to each cylinder. The relief valve provides protection for the system when high pressure results from any abnormal condition, such as excessive effort on the steering wheel. The replenishing valve is connected to the oil in the replenishing reservoir. When pressure in one side of the system falls below atmospheric pressure, its replenishing valve opens, admitting replenishing oil.

If a bridge steering stand for operating the Forward Telemotor from the deck above the Pilot House is required, a mitre gear connection is provided on the Forward Telemotor to which a vertical shaft from the bridge steering stand may be coupled. A hand clutch is provided for engaging the mitre gear connection.

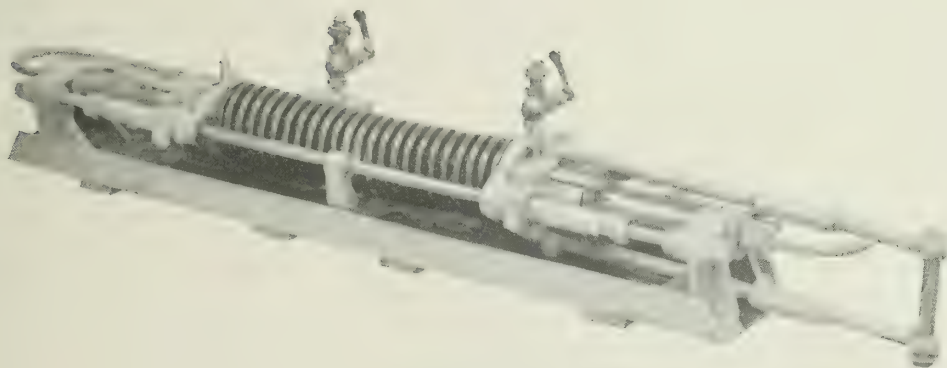
The After Telemotor consists of a double ended cylinder with a plunger in each end of the cylinder. The plungers are fixed and the double ended cylinder is free to move on the plungers. A spring tends to hold the cylinder in a central position or to return the cylinder to a central position after the cylinder has been moved in either direction. A link attached to the double cylinder transmits movement of the cylinder to the steering gear.



The connecting tubing consists of two lines, each connecting one cylinder in the Forward Telemotor to one end of the double cylinder in the After Telemotor. When the steering wheel on the Forward Telemotor is rotated, the rack pinion rotates, forcing one pump plunger downward and the other plunger upward. In the cylinder in which the plunger is forced downward, pressure is set up in the oil. The pressure is transmitted by one line of the connecting tubing to one end of the double cylinder in the After Telemotor, causing a movement of the double cylinder.

The After Telemotor may be assembled to either hand to suit a particular steering gear arrangement.

A hand operated charging pump and a supply tank are provided for mounting near the After Telemotor.



**AFTER TELEMOTOR**

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## OPERATION

Instructions for charging and venting the system are found on Page 7. When the system has been properly vented and all valves are closed, the Telemotor should be ready for operation.

Rotating the steering wheel in either direction from amidships position moves the After Telemotor correspondingly. The hardover position on either side of the Forward Telemotor helm indicator moves the After Telemotor the full distance, or six inches from the central position. If the Telemotor is in proper adjustment, the steering gear will move the rudder to the desired hard-over position.

Frequent checking to see that the After Telemotor responds to various settings of the Forward Telemotor is advisable, especially after newly charging the system. A check can best be made in the hardover position. If the venting procedure does not remedy the condition, the system must be examined for leaks which would allow a loss of pressure. Leaks are also means of allowing air into the system, therefore, after leaks are found and eliminated, the system may require further venting to expel air introduced through former leaks.

To sum up, when testing indicates trouble, take these steps until the system operates properly:

- (1) Vent thoroughly as described on Page 7.
- (2) Eliminate leaks.
- (3) Vent thoroughly.

Covers (Q) give access to relief valves (P) and the plunger stuffing box glands. The plunger glands should be tightened only enough to prevent leak-

## CHARGING AND VENTING

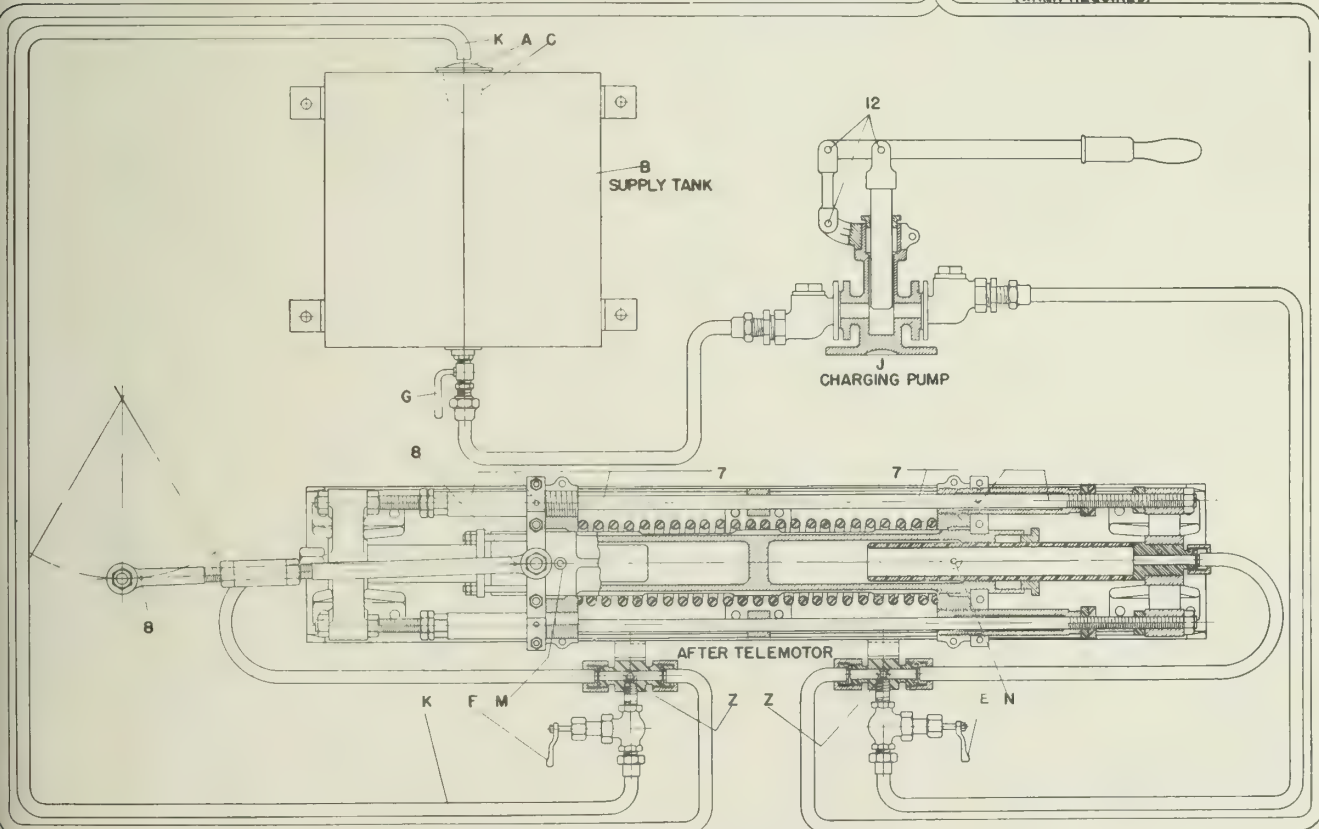
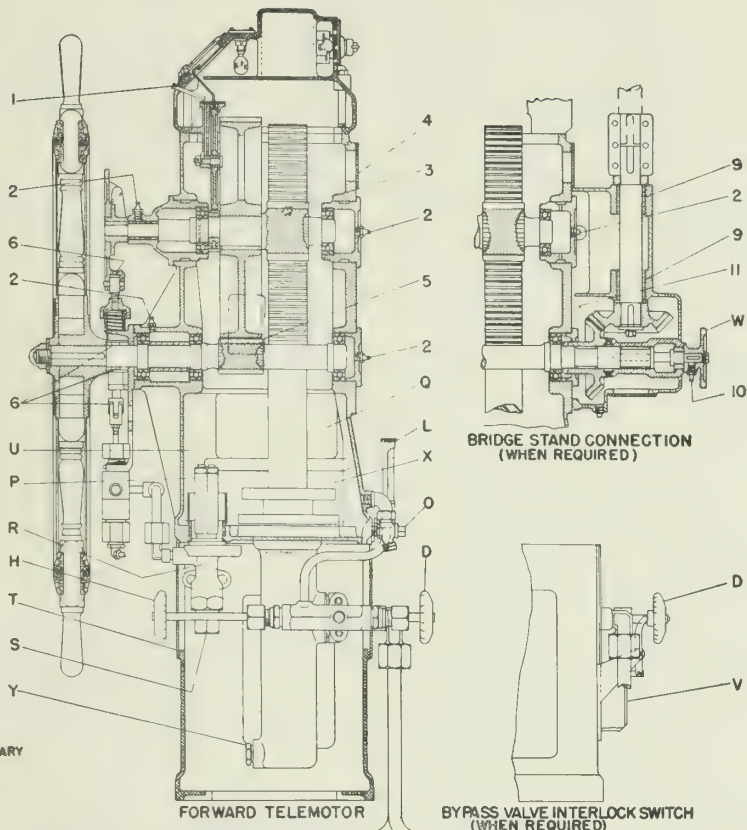
1. FILL TANK B THROUGH STRAINER C WITH "TELE MOTOR OIL".
2. OPEN COCK G, VALVES E, F, D AND STROKE PUMP J UNTIL THE FLOW FROM PIPE K INDICATES ELIMINATION OF ALL AIR POSSIBLE.
3. CLOSE VALVE F AND AT THE SAME TIME MAINTAIN A SLIGHT BUT STEADY OIL PRESSURE WHILE THE AFTER CYLINDERS ARE BEING VENTED AT M AND N.
4. AFTER CLOSING THESE VENTS, OPEN VALVE H AND STROKE PUMP UNTIL OIL LEVEL IS ABOUT  $\frac{1}{2}$  FROM TOP OF GAGE GLASS L, THEN CLOSE VALVE E, STOP PUMPING AND CLOSE VALVES D AND H.

## OPERATION

1. WHEN THE SYSTEM HAS BEEN PROPERLY VENTED AND ALL VALVES CLOSED THE TELE MOTOR IS READY FOR OPERATION.
2. FOR TELE MOTOR WITH BRIDGE STAND CONNECTION ENGAGE THE CONNECTING CLUTCH BY MEANS OF HANDWHEEL W WHEN BRIDGE STAND CONTROL IS DESIRED.
3. FOR ELECTRIC STEERING OPEN BYPASS VALVE D. IF BYPASS VALVE INTERLOCK SWITCH IS INSTALLED, OPENING VALVE D WILL AUTOMATICALLY CLOSE BYPASS VALVE INTERLOCK SWITCH V PERMITTING ELECTRIC STEERING CONTROL.

## LUBRICATION

FORWARD UNIT	NO. OF PLACES	METHOD	LUBRICANT	APPLICATION
1. INDICATOR GEAR RACK.	2	OIL CAN	LIGHT OIL	WEEKLY
2. SHAFT BEARINGS	4	GUN	MEDIUM GREASE	MONTHLY
3. RACK GUIDES	2	GUN	MEDIUM GREASE	WEEKLY
4. RACK & PINION TEETH	1	BRUSH	GEAR GREASE	WEEKLY
5. INT. GEAR & PINION TEETH	1	BRUSH	GEAR GREASE	WEEKLY
6. AUTO. BYPASS LINKAGE	6	OIL CAN	LIGHT OIL	WEEKLY
AFTER UNIT				
7. TIE RODS & STOP SLEEVES	12	OIL CAN	LIGHT OIL	DAILY
8. CONNECTING LINK PINS	4	OIL CAN	LIGHT OIL	DAILY
BRIDGE STAND CONNECTION (WHEN USED)				
9. VERTICAL SHAFT BEARINGS	2	GUN	MEDIUM GREASE	WEEKLY
10. CLUTCH OPERATING MECHANISM	1	GUN	MEDIUM GREASE	WEEKLY
11. MITER GEARS	1	BRUSH	GEAR GREASE	WEEKLY
CHARGING PUMP				
12. LEVER PINS	3	OIL CAN	LIGHT OIL	WHEN NECESSARY



HYDE HYDRAULIC TELE MOTOR INSTRUCTION CHART



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age. Unnecessary tightness will increase the drag on the plunger and increase the effort required to steer.

Cover (T) gives access to replenishing valves (R) and the sediment bulbs (S).

Relief valves (P) are set to relieve at about 1200 p.s.i. Setting is adjusted by screws (U).

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## INSTALLATION

### Connecting Tubing

With the Forward Telemotor installed in its usual position the helmsman faces forward. Then rotation of the top of the steering wheel to the right results in forcing the port plunger down and the starboard plunger up. In other words, when the steering wheel is rotated for right rudder, oil in the port cylinder of the Forward Telemotor is under pressure. Examination of the steering gear will indicate in which direction the double cylinder of the After Telemotor should move for right rudder. This will show which end of the double cylinder should have pressure on it for right rudder. The end of the double cylinder which should have pressure on it for right rudder should then be connected by tubing to the port cylinder of the Forward Telemotor.

The connecting tubing may be run below decks in protected locations with moderate bends to accommodate available space. Tubing should be run in a gradual rise from the After Telemotor to the Forward Telemotor to avoid air pockets. Areas subjected to abrupt temperature changes should be avoided in order to keep volume changes of the oil to a minimum.

It is of utmost importance that all joints and valves in the system be oil-tight.

### Alignment

The only alignment necessary during installation of the Telemotor is to check that the connecting links between the After Telemotor and the steering gear are adjusted so that when the After Telemotor is in a central position as determined by its spring, the connecting links hold the steering gear in the amidships position. The connecting links may be adjusted by means of turn-buckles.

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The After Telemotor is adjusted in our shop so that the double cylinder is held in a central position by the Telemotor spring unless pressure acts on one end of the double cylinder. The Forward Telemotor is adjusted in our shop so that the automatic bypass valve is open when the steering wheel is in the amidships position. Therefore, each time the steering wheel is placed amidships, the After Telemotor will center itself, since there is no pressure on either end of the double cylinder.

The After Telemotor is adjusted in our shop so that full travel in either direction from the central position is six inches, or a total travel of twelve inches. Hyde Windlass Company steering gears are designed so that twelve inches travel of the linkage actuated by the After Telemotor moves the rudder from hardover to hardover. The length of travel may be adjusted if necessary. Referring to Page 16, the position of the sleeve, Part (17), determines the length of travel, with the locknuts at the ends of the sleeves acting as stops. The sleeve (17) screws into the spring seat (7) and may be screwed in or out to make adjustments. The length of travel from the central position to hardover is equal to the distance from the cylinder yoke (6) to the locknuts at the end of the sleeve (17). A setscrew in each spring seat (7) secures each sleeve when adjustment is complete. Care must be taken to adjust both stops on each end of the After Telemotor so that they are as equal as practical to prevent the possibility of one stop taking all the load. Travel in both directions from the central position should also be adjusted so they are equal.

### **Flushing Out The System**

The newly installed Telemotor must be thoroughly flushed out to remove any foreign matter which may be accumulated in the system during installation. Flushing should be done with the same kind of oil that will be used in the system for operation.

Fill the supply tank (B) through strainer (C). Open cock (G), valves (D), (E) and (F) and stroke charging pump (J) until the discharge into the tank (B) is free of foreign matter. This will flush tank (B) and the tubing system. Replenishing reservoir (X) in the Forward Telemotor should be swabbed out with oil. Access to (X) may be had through covers (Q). All flushing oil should be removed from the system preparatory to charging the system with clean oil for operation.



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## **Draining The System**

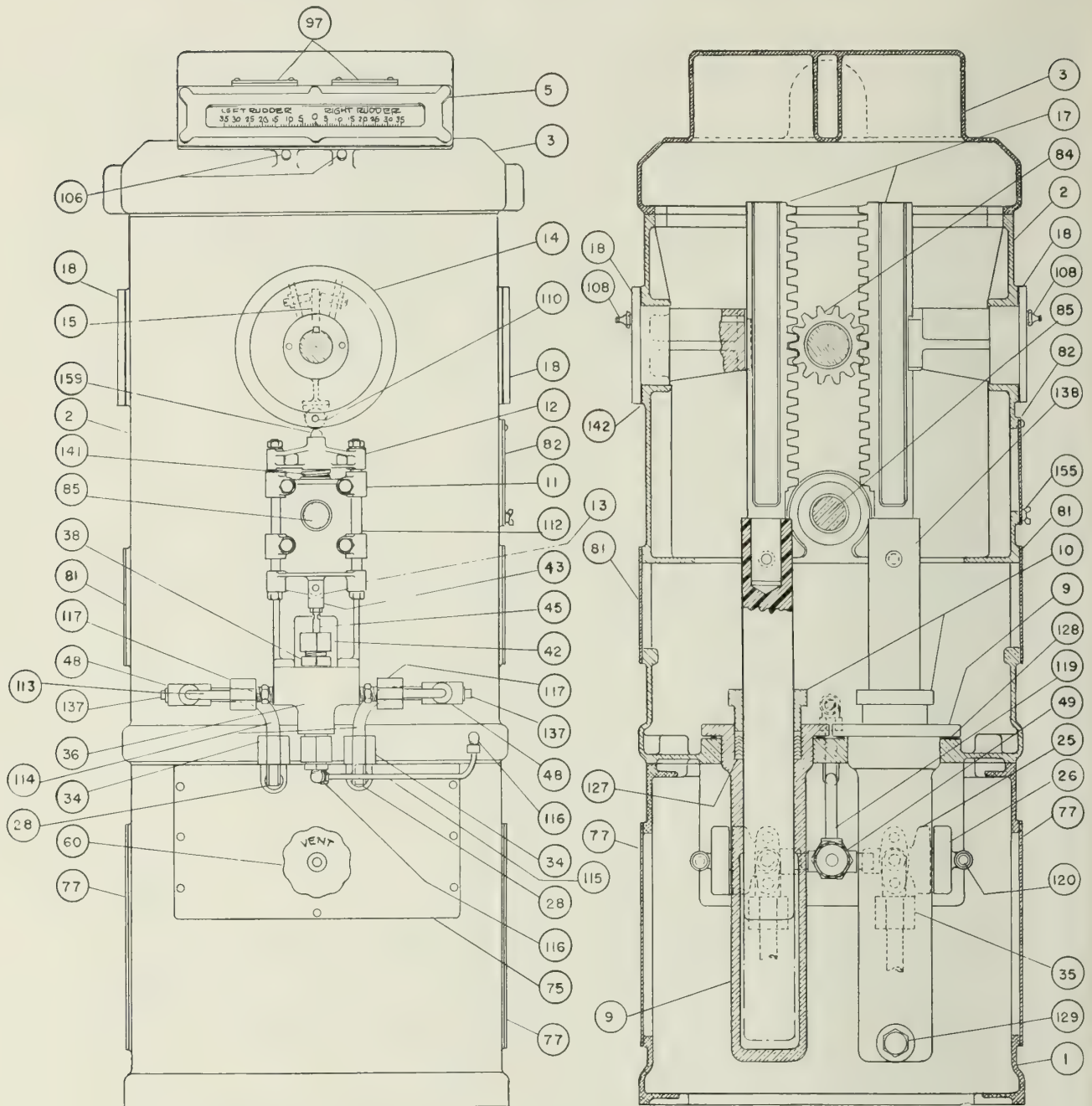
The main system may be drained by removing drain plugs (Z). Valves (D), (E), (F) and (H) should be open.

Drain plugs (Y) are provided for draining cylinder and sediment bulbs (S) are provided for draining the relief and replenishing valves (R). Drain cock (O) is provided for draining the replenishing reservoir only.

## **Telemotor Oil**

The oil used for the hydraulic system is the type that is sold by most manufacturers under the title "Telemotor Oil." This oil must be a low cold test mineral oil of about 100 seconds viscosity Saybolt at 100 degrees Fahrenheit.

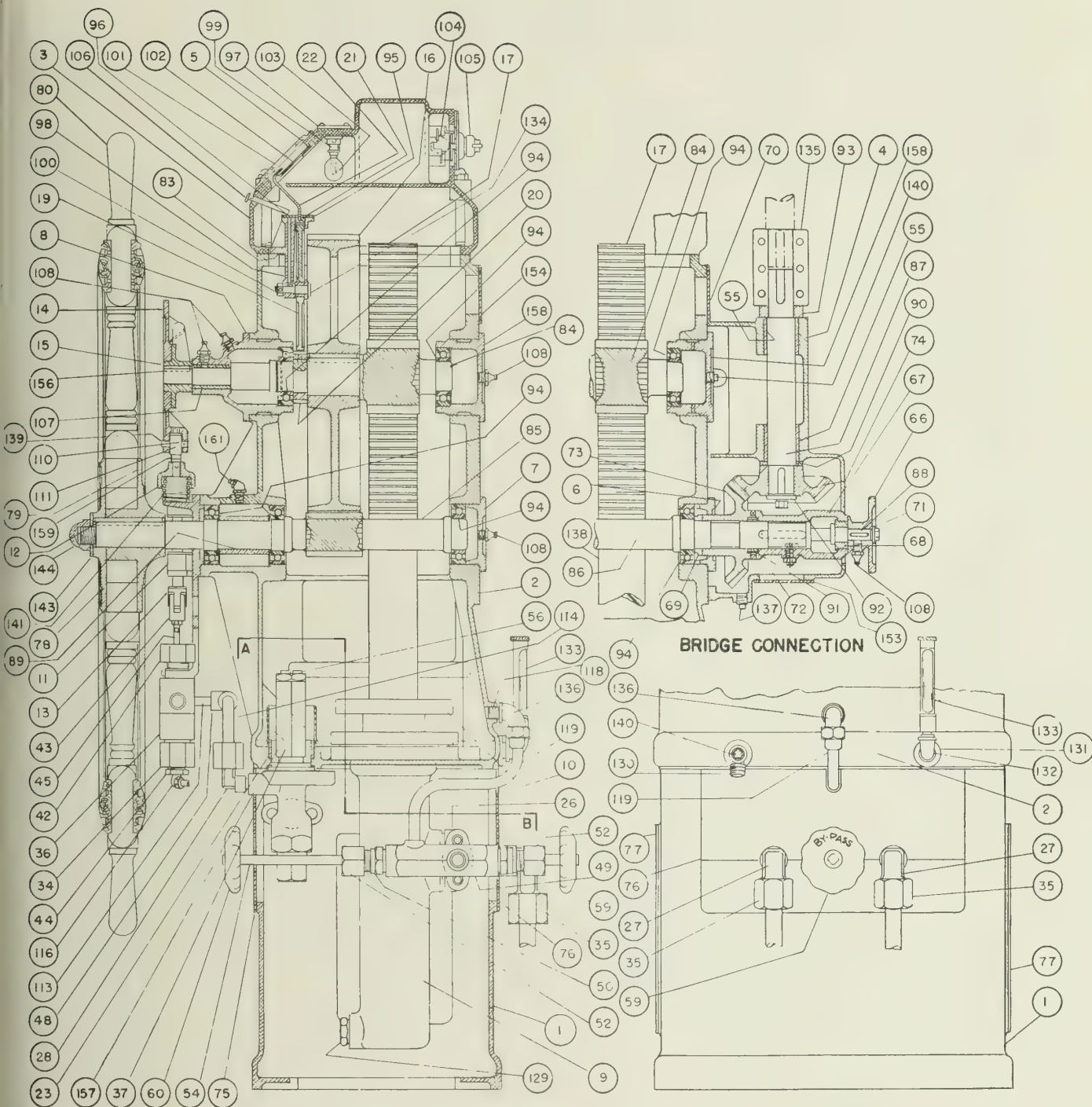
# LIST OF PARTS — FORWARD TELEMOTOR



1. BASE
2. CASING
3. TOP COVER
- \*4. MITRE GEAR SHAFT BEARING AND GEAR GUARD
5. INDICATOR COVER
- \*6. STEERING WHEEL SHAFT BEARING RETAINER
7. STEERING WHEEL SHAFT BEARING RETAINER
8. RACK PINION SHAFT BEARING CAGE
9. CYLINDER
10. GLAND
11. AUTOMATIC BYPASS FRAME
12. UPPER CROSS BAR
13. LOWER CROSS BAR
14. ROLLER CARRIER
15. ROLLER CARRIER HUB
16. INTERMEDIATE GEAR
17. PLUNGER RACK
18. RACK GUIDE

19. INDICATOR GEAR
20. INDICATOR PINION
21. INDICATOR RACK
22. INDICATOR POINTER
23. REPLENISHING VALVE BODY
25. CROSS
26. SPECIAL ELBOW
27. SPECIAL ELBOW
28. SPECIAL ELBOW
34. NUT (UNION)
35. NUT (UNION)
36. AUTOMATIC BYPASS VALVE BODY
37. RELIEF VALVE BODY
38. STUFFING BOX
42. GLAND NUT
43. VALVE STEM KNUCKLE
44. PLUG
45. VALVE STEM
48. PIPE TEE
49. BYPASS VALVE BODY
50. STUFFING BOX

52. GLAND NUT
54. VENT VALVE STEM
55. BUSHING
56. ADJUSTING SCREW
59. BYPASS HANDWHEEL
60. VENT HANDWHEEL
- \*66. HANDWHEEL
- \*67. CLUTCH
- \*68. CLUTCH BUSHING
- \*69. MITRE GEAR THRUST COLLAR COVER
- \*71. CLUTCH CONTROL SCREW CAP
- \*72. BRUSH HOLE COVER (FAR SIDE)
- \*73. MITRE GEAR (WITH CLUTCH GRABS)
- \*74. MITRE GEAR
75. FRONT COVER
76. BACK COVER
77. SIDE COVER
78. STEERING WHEEL HUB
79. STEERING WHEEL HUB
80. WOOD STEERING WHEEL



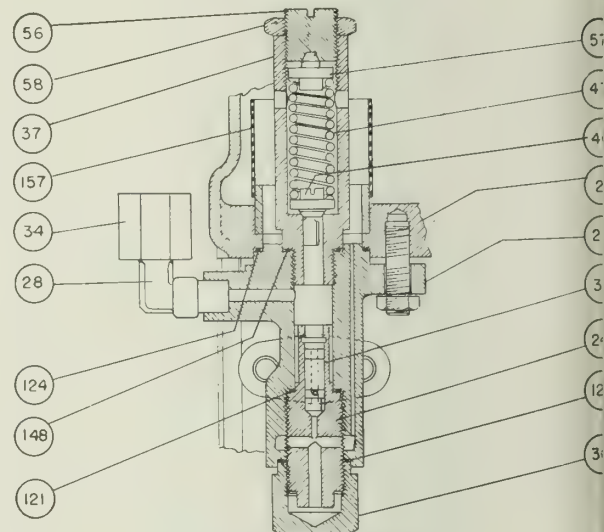
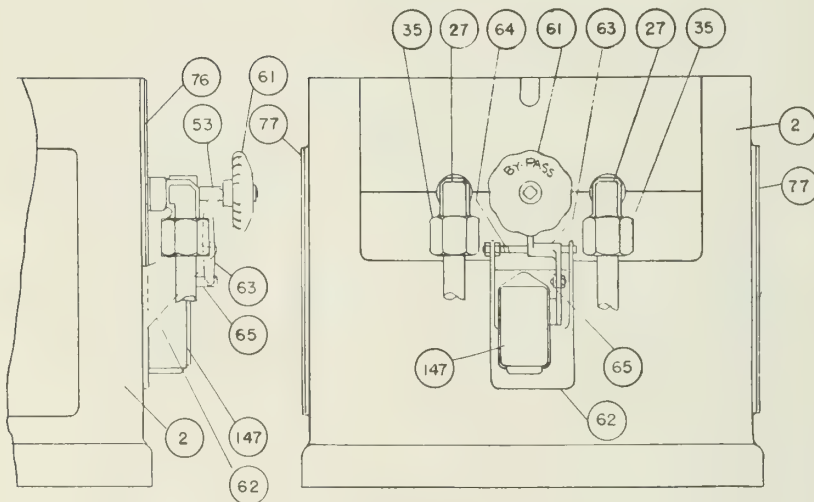
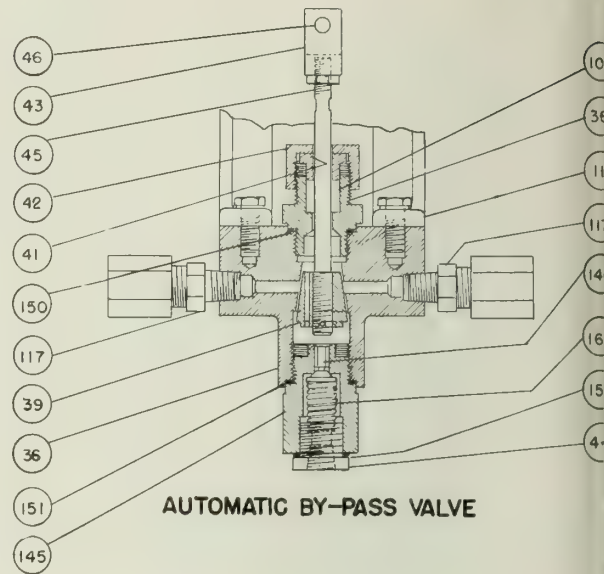
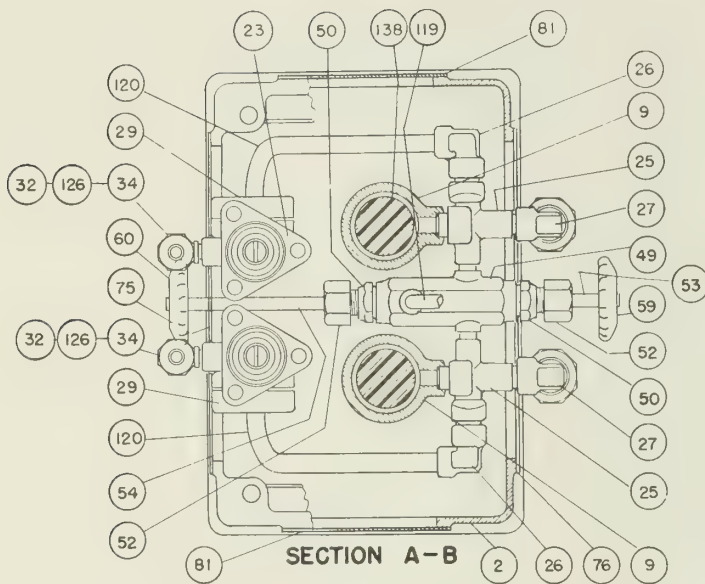
- 81. COVER
- 82. COVER
- 83. INDICATOR RACK GUIDE SHIM
- 84. RACK PINION SHAFT
- 85. STEERING WHEEL SHAFT
- \*86. STEERING WHEEL SHAFT
- \*87. MITRE GEAR SHAFT
- \*88. CLUTCH CONTROL SCREW
- 89. BEARING SPACER
- \*90. THRUST COLLAR
- \*91. CLUTCH THRUST BUSHING
- \*92. SHAFT CAP
- \*93. THRUST COLLAR
- 94. SKF BEARING NO. 6208Z
- 95. INDICATOR RACK COVER
- 96. INDICATOR RACK COVER
- 97. LAMP BASE COVER
- 98. INDICATOR RACK BRACKET
- 99. LAMP BASE
- 100. IDLER GEAR STUD
- 101. INDICATOR GLASS
- 102. INDICATOR DIAL

- 103. INCANDESCENT LAMP
- 104. GLAND, WATER TIGHT
- 105. SWITCH
- 106. PLAIN DRIVE OILER
- 107. BUSHING
- 108. HYDRAULIC GREASE FITTING
- 110. BUSHING
- 111. ROLLER
- 112. TIE ROD
- 113. PIPE
- 114. PIPE
- 115. TUBING
- 116. ELBOW
- 117. UNION COMPLETE
- 118. NIPPLE
- 119. PIPE
- 120. PIPE
- 127. GARLOCK CHEVRON PACKING
- 128. GASKET
- 129. DRAIN PLUG
- 130. DRAIN OFF COCK
- 131. BUSHING

- 132. STREET ELL
- 133. OIL GAUGE
- 134. BUSHING
- \*135. COUPLING (HALF)
- 136. FEMALE UNION ELBOW
- 137. PIPE PLUG
- 138. PLUNGER
- 139. ROLLER PIN
- \*140. PIPE PLUG
- 141. AUTOMATIC BYPASS VALVE SPRING
- 142. RACK GUIDE SHIM (LAMINATED)
- 143. HANDWHEEL WASHER
- 144. HANDWHEEL CAP NUT PLAIN
- \*153. COVER
- 154. COVER
- 155. THUMB NUT
- 156. ROLLER CARRIER SHAFT
- 157. STRAINER COMPLETE
- 158. RACK PINION SHAFT BEARING CAGE
- 159. AUTOMATIC BYPASS VALVE PUSH PIN
- 161. HYDRAULIC GREASE FITTING



# LIST OF PARTS — FORWARD TELEMOTOR

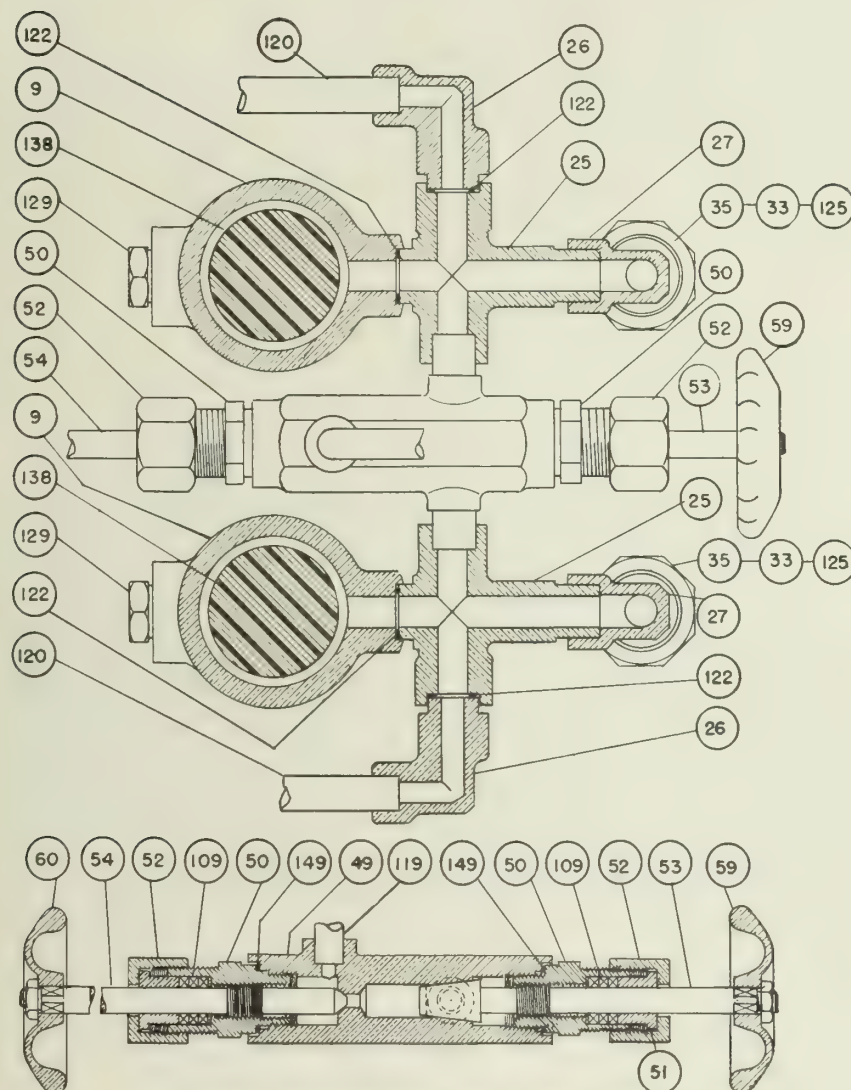


- 2. CASING
- 9. CYLINDER
- 11. AUTOMATIC BYPASS FRAME
- 23. REPLENISHING VALVE BODY
- 24. REPLENISHING VALVE SEAT
- 25. CROSS
- 26. SPECIAL ELBOW
- 27. SPECIAL ELBOW
- 28. SPECIAL ELBOW
- 29. PIPE FLANGE
- 30. REPLENISHING VALVE NUT
- 31. REPLENISHING VALVE

- 32. TAIL PIECE
- 33. TAIL PIECE
- 34. NUT (UNION)
- 35. NUT (UNION)
- 36. AUTOMATIC BYPASS VALVE BODY
- 37. RELIEF VALVE BODY
- 38. STUFFING BOX
- 39. AUTOMATIC BYPASS VALVE
- 40. RELIEF VALVE
- 41. GLAND
- 42. GLAND NUT
- 43. VALVE STEM KNUCKLE

- 44. PLUG
- 45. VALVE STEM
- 46. KNUCKLE PIN
- 47. RELIEF VALVE SPRING
- 49. BYPASS VALVE BODY
- 50. STUFFING BOX
- 51. GLAND
- 52. GLAND NUT
- 53. BYPASS VALVE STEM
- 54. VENT VALVE STEM
- 56. ADJUSTING SCREW

# LIST OF PARTS — FORWARD TELEMOTOR




**BY-PASS & VENT VALVES AND CONNECTIONS**

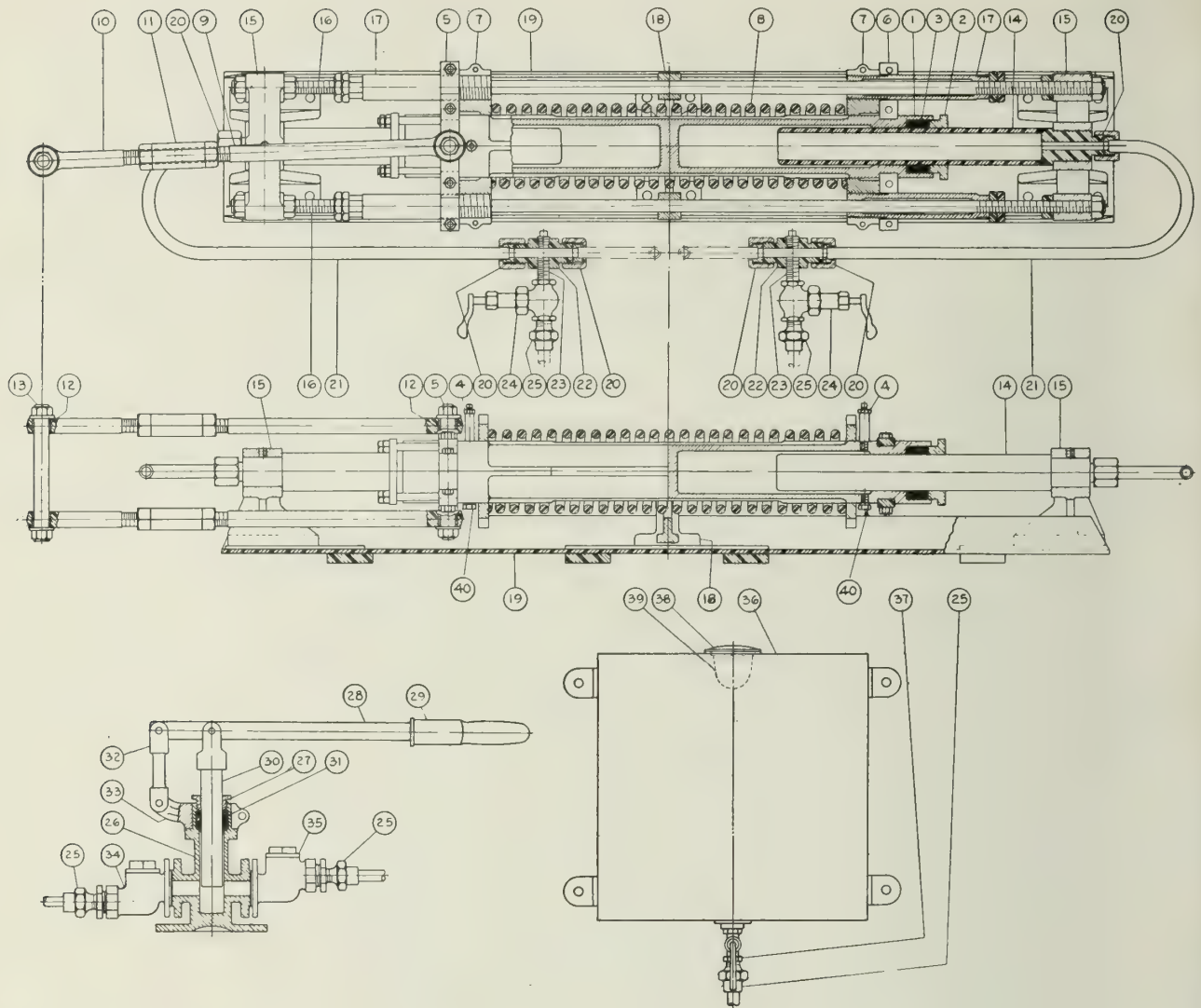
- 57. VALVE SPRING SEAT
- 58. LOCKNUT
- 59. BYPASS HANDWHEEL
- 60. VENT HANDWHEEL
- 61. BYPASS HANDWHEEL
- 62. LEVER BEARING
- 63. CONTROL LEVER
- 64. LIMIT SWITCH LEVER PIN
- 65. LIMIT SWITCH CONNECTING LINK
- 75. FRONT COVER
- 76. BACK COVER
- 77. SIDE COVER

- 81. COVER
- 109. PACKING
- 117. UNION COMPLETE
- 119. PIPE
- 120. PIPE
- 121. GASKET
- 122. GASKET
- 123. GASKET
- 124. GASKET
- 125. RING UNION
- 126. RING UNION
- 129. DRAIN PLUG

- 138. PLUNGER
- 145. RELIEF VALVE BODY
- 146. RELIEF VALVE
- 147. LIMIT SWITCH
- 148. GASKET
- 149. GASKET
- 150. GASKET
- 151. GASKET
- 152. GASKET
- 157. STRAINER COMPLETE
- 160. BYPASS VALVE SPRING

ITEMS MARKED  USED ONLY WITH BYPASS SWITCH CONTROL

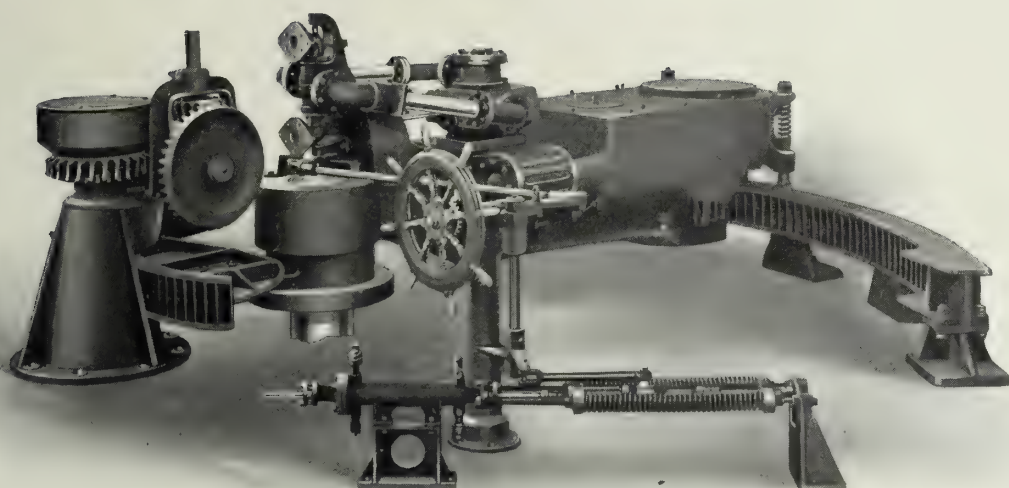
# LIST OF PARTS — AFTER TELEMOTOR



1. CYLINDER
2. CYLINDER GLAND
3. PACKING RINGS
4. VENT PLUG
5. CYLINDER YOKE WITH TRUNNIONS (TWO HALVES)
6. CYLINDER GLAND (TWO HALVES)
7. SPRING SEAT
8. SPRING
9. ROD END (LONG)
10. ROD END (SHORT)
11. TURNBUCKLE
12. ROD END BUSHING
13. LINK PIN
14. PLUNGER
15. PLUNGER BRACKET
16. TIE ROD
17. SLEEVE
18. TIE ROD SUPPORT
19. BED PLATE
20. UNION

21. PLUNGER PIPE
22. SPECIAL FITTING
23. NIPPLE
24. GLOBE VALVE
25. MALE AND FEMALE UNION
26. CHARGING PUMP BODY
27. CHARGING PUMP BODY GLAND
28. CHARGING PUMP LEVER
29. CHARGING PUMP HANDLE
30. CHARGING PUMP PLUNGER
31. CHARGING PUMP PACKING
32. CHARGING PUMP LINK
33. CHARGING PUMP YOKE
34. CHARGING PUMP OUTLET CHECK VALVE
35. CHARGING PUMP INLET CHECK VALVE
36. TELEMOTOR SUPPLY TANK
37. TELEMOTOR SUPPLY TANK PLUG VALVE
38. TELEMOTOR SUPPLY TANK FILLER CAP
39. TELEMOTOR SUPPLY TANK STRAINER
40. DRAIN PLUG

# The Brown Type Steam Tiller



Hyde Windlass Company  
Bath, Maine



# The Brown Type Steam Tiller

Many steamships have their steering engines placed near the bridge, the communication being made with the quadrant aft by means of chain, rods, or wire ropes, with or without spring buffers to take off the shock of a heavy sea. In conjunction with this, hand gear is fitted aft, having double screws with nuts and crosshead, the mode of connection being by pins dropping into connecting links, or by a clutch working on the rudderhead and engaging the crosshead.

The trouble involved in keeping these steering ropes or rods properly adjusted and the various pulleys properly oiled, as well as danger arising from the ropes being carried away, has brought about a change in more recent applications of steering gear. The steering engine is placed aft, being coupled by right and left-hand screws, and in a variety of other ways, direct to the rudderhead, communication from the steering valve being made by a line of shafting to the bridge, thus dispensing with the objectionable rope or rod communication, which is, in the first-mentioned system, subjected to the full rudder strains.

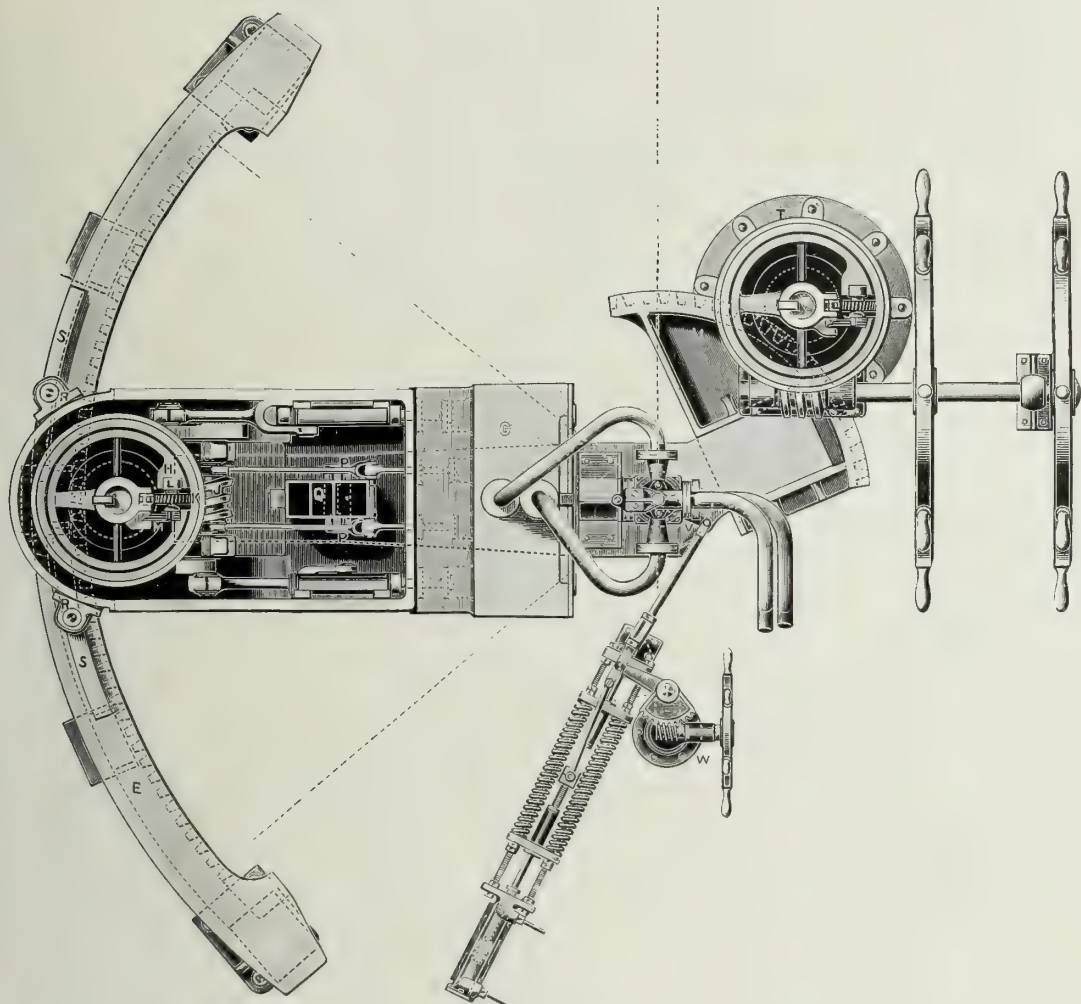
An ideally perfect steering gear should fulfill the following conditions:

1. The steering engine should be attached to the rudderhead without the intervention of chains or ropes.
2. It should let go the rudder when unduly strained, and when the abnormal strain has gone, return automatically to its former position.
3. The connection from steam to hand gear, and vice versa, should be effected without the use of jaw clutches or the slipping of bolts into holes — which operations are difficult to effect when the ship is rolling at sea with the rudder adrift.
4. The communication from the bridge to the machinery aft should be of a kind which dispenses with rods, chains and shafting, all being equally troublesome to the shipbuilder to arrange and to the officers of the ship to keep in order.

With reference to Condition 3, it is a common practice to fit rubber brakes on ships where clutches are the means of connection; but as simplicity and fewness of parts are of first importance in steering gear, it is better that such a connection between the steering engine and the rudder, or the hand gear and the rudder, should be one which will act both as a clutch and a brake.

To meet these conditions as far as possible, the Steam Tiller has been designed. In the accompanying illustration, Fig. 1 shows an elevation with hand steering gear, Fig. 2 being the plan. The prominent feature of this gear, in which it differs from all others, is that advantage is taken of as long a lever as will reach from the rudderhead to the limits of the poop deck, which, in the greatest number of ships, varies from 7 to 10 feet, and in the largest class of vessels has reached the length of 17 feet.

It will be obvious that the strains at the end of such a lever will be reduced to the smallest possible amount, and that the gear necessary to give the requisite power to steering the ship will be of the simplest form.



Nº 1

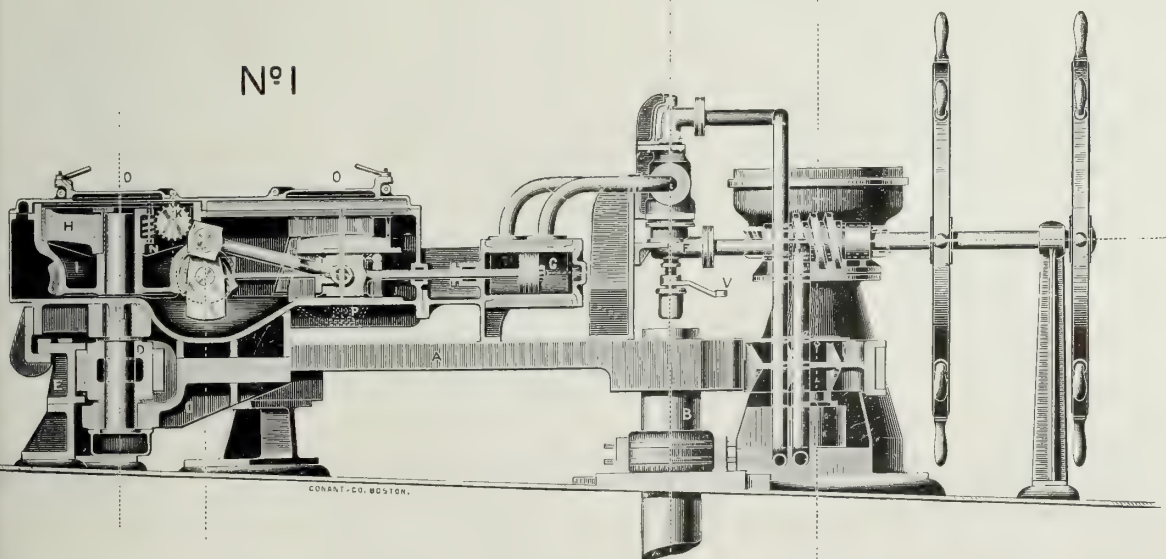


FIG. 1

## Description of the Steam Tiller

The Tiller as shown in Fig. 1, "A," keyed to the rudderhead, "B," and at the other end a jaw "C" is fitted with gun metal bearings, into which a driving pinion "D" works, gearing into the toothed segment "E," which is bolted securely to the deck. The steering engines are carried on the Tiller and move round with it, receiving and exhausting their steam through a double stuffing box arrangement "F," mounted on the axis of the rudderhead.

The steam cylinders "G" are of the usual well-known construction, fitted with piston valves. Motion is communicated to the pinion "D," through the intervention of an expanding friction clutch "H," which is lined with friction material, and engages the worm wheel "I." This wheel, to reduce friction, is carefully machined in the teeth, and made an exact fit to the worm "J," which is of bearing bronze, and works in the worm wheel without any backlash or shake.

Motion is given to this worm by the steam engine as shown. The clutch "H" is expanded by a screw bolt and worm wheel "K," which turns in and out of the nut "L" at one end, the other abutting against a series of laminated springs "M," so that by turning the worm "N" by a handle (provided for the purpose) to the right or left, the steam gear is engaged or disengaged at any position the rudder may be in, and at the same time it forms an efficient brake to seize hold of the rudder in a seaway.

In practice it is usual to expand this friction brake or clutch sufficiently tight to put the rudder hard over at full speed trials; but the springs in any case have not sufficient force to hold the connection tight enough to cause fracture of any part of the machinery.

In the event of a heavy sea striking the rudder, it immediately slips, allowing the rudder to move out of position; but by that act the steam valve is opened and the engines bring the rudder back to its normal place. As the Steam Tiller is intended to work (and in most cases has been so fitted) on the open deck, without any house, the whole of the machinery is placed in a water-tight casing, which forms the framework of the steering engines, access to which is got by the doors "OO."

The oiling of the various parts is effected automatically by two valveless oil pumps "PP," driven off the valve rods of the engine. These throw the oil from a well in the bottom of the casing through the hollow piston rod into the reservoir "Q," and from there a copious supply of oil is supplied to every working part, as well as the piston and valve rods. In actual practice the oil is renewed once in three months, about two gallons being required.

This oiling arrangement is of the utmost importance to the durability of the machinery, as it has been found in a year's experience (June, 1892) of the running of a set in the steamship "Scot," on removing the cover with the intention of doing some repairs, that none of the bearings required taking up — showing clearly that, where dirt is kept out and copious lubrication applied, there is practically no wear.



The "Campania," after two years' work on the Atlantic, had her steering engine overhauled for the first time, and all that was done was to clean the parts, the wear being entirely on the oil and none on the bearing surfaces.

The pinion end of the tiller is carried up by gun metal slippers and spiral springs under the lugs "RR," which are capable of adjustment.

The hand gear consists of a strong standard "T," bolted to the deck, and carrying an exactly similar worm wheel, and worm with hand wheels and friction clutch as that described in the steam gear. At the lower end of the shaft there is a similar pinion to "D," which engages the toothed segment "U," which is securely bolted to the Steam Tiller, or keyed separate to rudderhead.

The operation in changing from hand to steam or steam to hand by means of these clutch brakes can be, and has been performed, without any undue haste, in half a minute. It may here be pointed out that the result of actual experience is that, with this system of hand gear, the friction is one third of that of the double screw system with nuts and connecting rods to a crosshead on the rudderhead. Therefore, one man on the worm wheel gear is as effective as three on double screws.

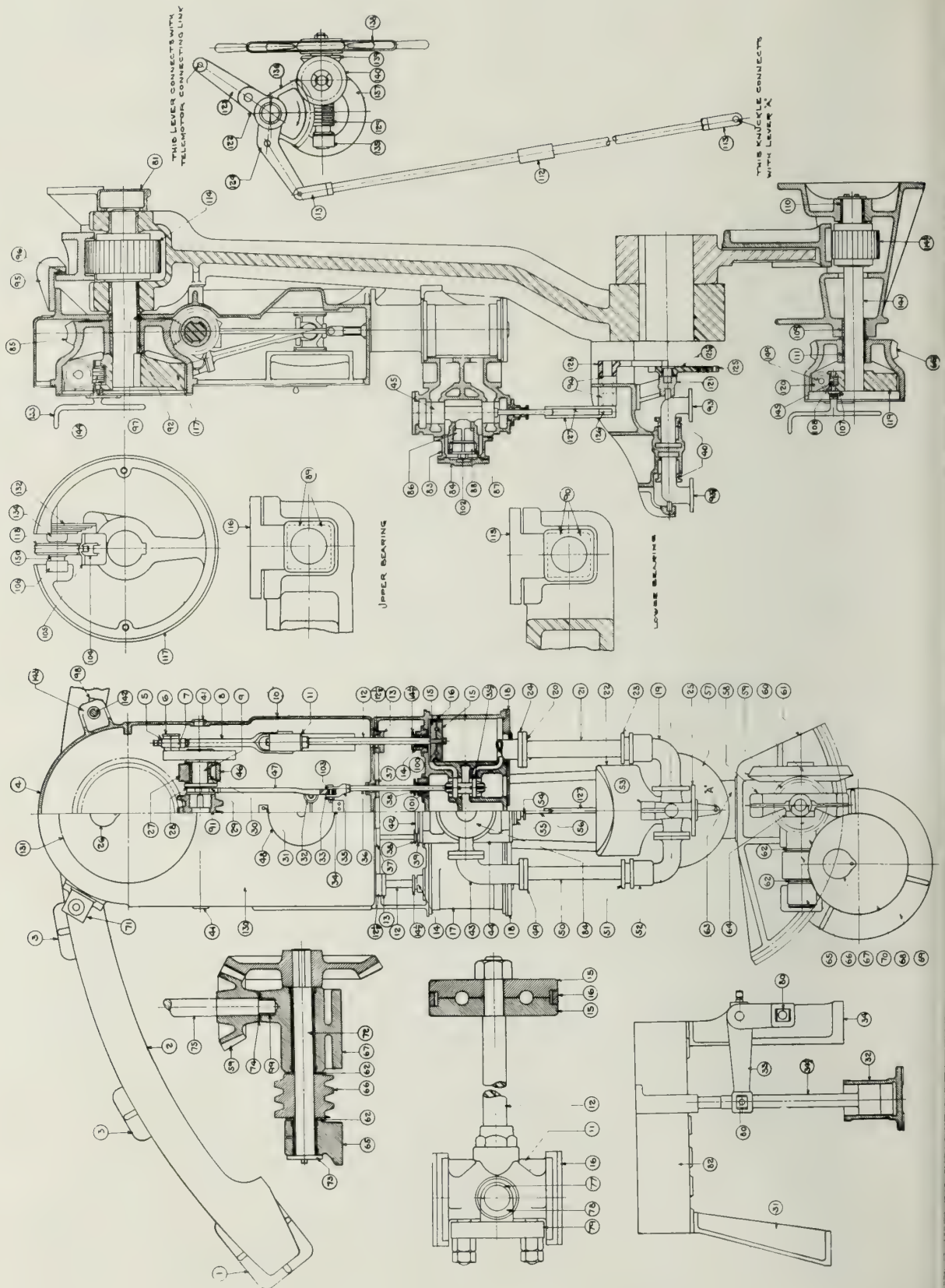
The hand wheels, it will be observed, are set to one side of the center line, which economizes space fore and aft, and brings the position of the man steering immediately opposite the compass.

The control valve is operated by the lever "V," and as the tiller moves round it carries the valve with it and so closes the port. The lever "V" is connected to the motor cylinder of the telemotor gear. From the motor cylinder leading up to the bridge are two pipes  $\frac{3}{4}$ -inch in diameter. In case of accident to these pipe communications to the bridge, a steering station "W" is shown aft, which can be connected to the control valve.

It is claimed for this design of steering gear that it has the fewest number of parts possible — namely, one pinion, one worm wheel and worm — which, it can easily be seen, is due to the fact that the toothed segment represents in a 10-foot tiller a steering wheel 20 feet in diameter, and this rack being shrouded to the points of the teeth and bolted at short intervals to the steel deck, is extremely secure. The pinion which engages this is a steel forging with machine-cut teeth.

From a commercial point of view, there is a distinct saving in the adoption of such a design, as no space is required for a steering engine amidships.





# List of Parts for Steam Tiller

1. End Chair.
2. Rack.
3. Intermediate Chair.
4. Pan End.
5. Connecting Rod Half Box.
6. Crank Web.
7. Connecting Rod Half Box.
8. Connecting Rod.
9. Crank Shaft.
10. Engine Pan.
11. Crosshead.
12. Piston Rod.
- 12½. Piston Rod Stuffing Box.
13. Piston Rod Gland.
14. Piston Rod Stuffing Box.
- 14½. Piston Rod Stuffing Box Gland.
15. Half Piston.
16. Piston Ring.
17. Double Cylinder.
18. Cylinder Cover.
19. Copper Pipe Fitting & Flange.
20. Copper Pipe Flange.
21. Copper Pipe.
22. Trunnion Stand.
23. Copper Pipe Gland.
24. Steam Pipe Fitting & Flange.
25. Steam Pipe Connection.
26. Hand Hole Cover.
27. Main Bearing Box (Bottom).
28. Eccentric Strap (Half).
29. Eccentric Strap (Half).
30. Main Bearing Box.
31. Oil Pump Bracket.
32. Oil Pump Cylinder.
33. Bell Crank Pump Lever, (Right Hand).
- 33½. Bell Crank Pump Lever, (Left Hand).
34. Oil Pump Bracket For Pump Lever.
- 34½. Oil Pump Piston.
35. Valve Stem Knuckle.
- 35½. Piston Valve.
36. Valve Stem.
37. Valve Stem Gland.
38. Valve Stem Stuffing Box Gland.
39. Valve Stem Stuffing Box.
40. Trunnion Stand Gland.
41. Plug.
42. Control Valve Cover.
43. Pipe Fitting and Flange.
44. Control Valve Body.
45. Control Valve Piston Valve.
46. Main Bearing Cap.
47. Eccentric Rod.
48. Hand Hole Cover.
49. Copper Pipe Flange.
50. Copper Pipe.
51. Copper Pipe Gland.
52. Copper Pipe Fitting & Flange.
53. Trunnion Stand Bracket.
54. Control Valve Stem Stuffing Box Gland.
55. Control Valve Stem Stuffing Box.
56. Control Valve Stem.
57. Main Tiller.
58. Control Shaft Bearing.
59. Bevel Pinion.
60. Bevel Gear.
61. Sector.
62. Thrust Collar.
63. Hand Tiller.
64. Control Shaft Bearing Cap.
65. Worm Shaft Bearing.
66. Hand Worm.
- 66½. Hand Worm Gear.
67. Worm Shaft Bearing.
68. Hand Gear Cover.
69. Hand Gear Stand.
70. Hand Hole Cover.
71. Buffer Spindle Bearing.
72. Worm Shaft.
73. Collar.
74. Collar.
75. Control Shaft.
76. Crosshead Gib.
77. Crosshead Half Box.
78. Crosshead Half Box.
79. Crosshead Binder.
80. Pump Lever Bushing.
81. Drip Oil Box.
82. Oil Pump Oil Tank.
83. Check Valve Body.
84. Check Valve Body Cover.
85. Engine Worm Gear.
86. Check Valve (Lower).
87. Check Valve Seat.
88. Check Valve (Upper).
89. Tiller Upper Bearing Box.
90. Tiller Lower Bearing Box.
91. Engine Worm.
92. Engine Gear Bushing.
93. Exhaust Pipe Connection.
- 93½. Steam Pipe Connection.
94. Bushing.
95. Rack Guide.
96. Rack Guide Shoe.
97. Flange Bushing.
98. Buffer Feet.
99. Bushing.
100. Piston Rod Stuffing Box Gland Bushing.
101. Valve Stem Stuffing Box Gland Bushing.
102. Nut.
103. Eccentric Rod Bushing.
104. Keeper.
105. Worm Shaft Cap.
106. Expanding Screw Nut.
107. Keeper.
108. Worm Shaft Cap.
109. Flange Bushing.
110. Flange Bushing.
111. Hand Worm Gear Bushing.
112. Turnbuckle.
113. Telemotor Rod Knuckle.
114. Pinion and Shaft.
- 114½. Hand Pinion.
115. Tiller Lower Bearing Cap.
116. Tiller Upper Bearing Cap.
117. Engine Expanding Clutch.
118. Engine Expanding Worm Gear.
119. Hand Expanding Clutch.
120. Hand Expanding Worm Gear.
121. Telemotor Lever Bearing.
122. 4" Lever.
123. 12" Lever.
124. 12" Lever.
125. Telemotor Lever.
- 125½. Telemotor Lever Bushing.
126. Valve Stem Lever.
127. Valve Stem Lever Link.
128. Block Lever.
129. Sector Worm Shaft.
130. Engine Pan Cover.
131. Engine Gear Cover.
132. Flat Spring.
133. Socket Wrench.
134. Rocker.
135. Worm Shaft Bearing.
136. Sector.
137. After Stand.
138. Steering Wheel.
139. Mitre Gear.
140. Mitre Gear with Clutch Grabs.
141. Hand Gear Shaft.
142. Buffer Spindle.
143. Buffer Spindle Spring.
144. Engine Expanding Clutch Worm.
145. Hand Expanding Clutch Worm.
146. Hand Expanding Clutch Flat Spring (Not Shown).
147. Hand Expanding Clutch Screw Nut (Not Shown).
148. Hand Expanding Clutch Rocker (Not Shown).
149. Hand Expanding Clutch Screw.
150. Engine Expanding Clutch Screw.









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